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STATE OF CALIFORNIA  
DEPARTMENT OF TRANSPORTATION

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**NOTICE TO CONTRACTORS  
AND  
SPECIAL PROVISIONS**

**FOR CONSTRUCTION ON STATE HIGHWAY IN**

**PLACER COUNTY IN ROSEVILLE FROM 2.4 KM EAST OF SOUTH ROSEVILLE OVERCROSSING TO 0.6  
KM WEST OF ATLANTIC STREET OVERCROSSING**

**DISTRICT 03, ROUTE 80**

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**For Use in Connection with Standard Specifications Dated JULY 1999, Standard Plans Dated JULY 1999, and Labor  
Surcharge and Equipment Rental Rates.**

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**CONTRACT NO. 03-375604**

**03-Pla-80-2.4/4.8**

**Federal Aid Project**

**ACIM-080-3(230)E**

**Bids Open: September 9, 2003  
Dated: July 14, 2003**

**OSD**

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# IMPORTANT SPECIAL NOTICES

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- DBEs must be certified by the California Unified Certification Program (CUCP). See Section 2, "Proposal Requirements and Conditions," of these special provisions for further details. The available sources for identifying certified DBEs have also been revised.
- The time allotted for the successful bidder to execute the contract and return it, together with the contract bonds, to the Department, has been revised. See Section 3, "Award and Execution of Contract," of these special provisions. Additional time will no longer be granted for return of the executed documents.



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# STANDARD PLANS LIST

The Standard Plan sheets applicable to this contract include, but are not limited to those indicated below. The Revised Standard Plans (RSP) and New Standard Plans (NSP) which apply to this contract are included as individual sheets of the project plans.

A10A	Abbreviations
A10B	Symbols
A20A	Pavement Markers and Traffic Lines, Typical Details
A20B	Pavement Markers and Traffic Lines, Typical Details
A20C	Pavement Markers and Traffic Lines, Typical Details
A20D	Pavement Markers and Traffic Lines, Typical Details
A24A	Pavement Markings - Arrows
A24B	Pavement Markings - Arrows
A24D	Pavement Markings - Words
A24E	Pavement Markings - Words and Crosswalks
A62A	Excavation and Backfill - Miscellaneous Details
A62B	Limits of Payment for Excavation and Backfill - Bridge Surcharge and Wall
A62C	Limits of Payment for Excavation and Backfill - Bridge
A62D	Excavation and Backfill - Concrete Pipe Culverts
RSP A62DA	Excavation and Backfill - Concrete Pipe Culverts
A62F	Excavation and Backfill - Metal and Plastic Culverts
A73A	Object Markers
A73B	Markers
RSP A73C	Delineators, Channelizers and Barricades
A74	Survey Monuments
A76A	Concrete Barrier Type 60
A76C	Concrete Barrier Type 60E
A76I	Concrete Barrier Type 60SE
A77A	Metal Beam Guard Railing – Typical Wood Post With Wood Block
A77AA	Metal Beam Guard Railing – Typical Steel Post With Wood Block
A77B	Metal Beam Guard Railing - Standard Hardware
A77C	Metal Beam Guard Railing – Wood Post and Wood Block Details
A77D	Metal Beam Guard Railing – Typical Layouts
A77E	Metal Beam Guard Railing – Typical Layouts
A77F	Metal Beam Guard Railing – Typical Embankment Widening for End Treatments
A77FA	Metal Beam Guard Railing – Typical Line Post Installation
RSP A77G	Metal Beam Guard Railing – End Treatment, Terminal Anchor Assembly (Type SFT)
A77H	Metal Beam Guard Railing - Anchor Cable and Anchor Plate Details
A77J	Metal Beam Guard Railing Connections to Bridge Railings, Retaining Walls and Abutments
A77K	Metal Beam Guard Railing Connections to Bridge Sidewalks and Curbs
RSP A77L	Metal Beam Guard Railing and Single Faced Barrier Railing Terminal System - End Treatments
RSP A77M	Metal Beam Guard Railing and Single Faced Barrier Railing Terminal System - End Treatment
A78EA	Double Thrie Beam Barrier - End Treatment
A82B	Crash Cushion (Type ADIEM)
A87	Curbs, Dikes and Driveways
A88A	Curb Ramp Details
A88B	Curb Ramp Details

D74B	Drainage Inlets
D74C	Drainage Inlet Details
D77A	Grate Details
D77B	Bicycle Proof Grate Details
D77C	Alternative Hinged Cover for Type OL and OS Inlets and Trash Rack for Type OCP Inlet
D78	Gutter Depressions
D79	Precast Reinforced Concrete Pipe - Direct Design Method
D87D	Overside Drains
D88	Construction Loads On Culverts
RSP D89	Pipe Headwalls
D94A	Metal and Plastic Flared End Sections
D94B	Concrete Flared End Sections
D97A	Corrugated Metal Pipe Coupling Details No. 1 - Annular Coupling Band Bar and Strap and Angle Connectors
D97B	Corrugated Metal Pipe Coupling Details No. 2 - Hat Band Coupler and Flange Details
D97C	Corrugated Metal Pipe Coupling Details No. 3 - Helical and Universal Couplers
D97D	Corrugated Metal Pipe Coupling Details No. 4 - Hugger Coupling Bands
D97E	Corrugated Metal Pipe Coupling Details No. 5 - Standard Joint
D97H	Reinforced Concrete Pipe or Non-Reinforced Concrete Pipe - Standard and Positive Joints
D102	Underdrains
T1A	Temporary Crash Cushion, Sand Filled (Unidirectional)
T1B	Temporary Crash Cushion, Sand Filled (Bidirectional)
RSP T2	Temporary Crash Cushion, Sand Filled (Shoulder Installations)
T3	Temporary Railing (Type K)
T4	Temporary Traffic Screen
T7	Construction Project Funding Identification Signs
T10	Traffic Control System for Lane Closure On Freeways and Expressways
T11	Traffic Control System for Lane Closure On Multilane Conventional Highways
T13	Traffic Control System for Lane Closure On Two Lane Conventional Highways
T14	Traffic Control System for Ramp Closure
T15	Traffic Control System for Moving Lane Closure On Multilane Highways
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**DEPARTMENT OF TRANSPORTATION**

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**NOTICE TO CONTRACTORS**

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**CONTRACT NO. 03-375604**

**03-Pla-80-2.4/4.8**

Sealed proposals for the work shown on the plans entitled:

**STATE OF CALIFORNIA; DEPARTMENT OF TRANSPORTATION; PROJECT PLANS FOR CONSTRUCTION ON STATE HIGHWAY IN PLACER COUNTY IN ROSEVILLE FROM 2.4 KM EAST OF SOUTH ROSEVILLE OVERCROSSING TO 0.6 KM WEST OF ATLANTIC STREET OVERCROSSING**

will be received at the Department of Transportation, 1120 N Street, Room 0200, MS #26, Sacramento, CA 95814, until 2 o'clock p.m. on September 9, 2003, at which time they will be publicly opened and read in Room 0100 at the same address.

Proposal forms for this work are included in a separate book entitled:

**STATE OF CALIFORNIA; DEPARTMENT OF TRANSPORTATION; PROPOSAL AND CONTRACT FOR CONSTRUCTION ON STATE HIGHWAY IN PLACER COUNTY IN ROSEVILLE FROM 2.4 KM EAST OF SOUTH ROSEVILLE OVERCROSSING TO 0.6 KM WEST OF ATLANTIC STREET OVERCROSSING**

General work description: Existing interchange to be widened and reconstructed, a new on-ramp tunnel, a new overcrossing bridge, pumping plant and retaining walls to be constructed.

This project has a goal of 17 percent disadvantaged business enterprise (DBE) participation.

No prebid meeting is scheduled for this project.

**THIS PROJECT IS SUBJECT TO THE "BUY AMERICA" PROVISIONS OF THE SURFACE TRANSPORTATION ASSISTANCE ACT OF 1982 AS AMENDED BY THE INTERMODAL SURFACE TRANSPORTATION EFFICIENCY ACT OF 1991.**

Bids are required for the entire work described herein.

At the time this contract is awarded, the Contractor shall possess either a Class A license or a combination of Class C licenses which constitutes a majority of the work.

This contract is subject to state contract nondiscrimination and compliance requirements pursuant to Government Code, Section 12990.

The District in which the work for this project is located has been incorporated into the Department's Northern Region. References in the Standard Specifications or in the special provisions to the district shall be deemed to mean the Northern Region. The office of the District Director for the Northern Region is located at Marysville.

The Department will consider bidder inquiries only when made in writing and shall be submitted to CALTRANS North Region Construction Office by either E-mail or Fax:

E-mail: [inquiry\\_nr\\_bid@dot.ca.gov](mailto:inquiry_nr_bid@dot.ca.gov)

FAX Number: (530) 822-4324

Responses to the bidder will be posted on the Internet at:

[www.dot.ca.gov/dist3/departments/construction/bidders/find\\_res.htm](http://www.dot.ca.gov/dist3/departments/construction/bidders/find_res.htm)

Project plans, special provisions, and proposal forms for bidding this project can only be obtained at the Department of Transportation, Plans and Bid Documents, Room 0200, MS #26, Transportation Building, 1120 N Street, Sacramento, California 95814, FAX No. (916) 654-7028, Telephone No. (916) 654-4490. Use FAX orders to expedite orders for project plans, special provisions and proposal forms. FAX orders must include credit card charge number, card expiration date and authorizing signature. Project plans, special provisions, and proposal forms may be seen at the above Department of Transportation office and at the offices of the District Directors of Transportation at Irvine, Oakland, and the district in which the work is situated. Standard Specifications and Standard Plans are available through the State of California, Department of Transportation, Publications Unit, 1900 Royal Oaks Drive, Sacramento, CA 95815, Telephone No. (916) 445-3520.

Cross sections for this project are not available.

The successful bidder shall furnish a payment bond and a performance bond.

The Department of Transportation hereby notifies all bidders that it will affirmatively ensure that in any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full opportunity to submit bids in response to this invitation.

The U.S. Department of Transportation (DOT) provides a toll-free "hotline" service to report bid rigging activities. Bid rigging activities can be reported Mondays through Fridays, between 8:00 a.m. and 5:00 p.m., eastern time, Telephone No. 1-800-424-9071. Anyone with knowledge of possible bid rigging, bidder collusion, or other fraudulent activities should use the "hotline" to report these activities. The "hotline" is part of the DOT's continuing effort to identify and investigate highway construction contract fraud and abuse and is operated under the direction of the DOT Inspector General. All information will be treated confidentially and caller anonymity will be respected.

Pursuant to Section 1773 of the Labor Code, the general prevailing wage rates in the county, or counties, in which the work is to be done have been determined by the Director of the California Department of Industrial Relations. These wages are set forth in the General Prevailing Wage Rates for this project, available at the Labor Compliance Office at the offices of the District Director of Transportation for the district in which the work is situated, and available from the California Department of Industrial Relations' internet web site at: <http://www.dir.ca.gov>. The Federal minimum wage rates for this project as predetermined by the United States Secretary of Labor are available through the California Department of Transportation's Electronic Project Document Distribution Site on the internet at <http://hqidoc1.dot.ca.gov/>. Addenda to modify the Federal minimum wage rates, if necessary, will be issued to holders of "Proposal and Contract" books. Future effective general prevailing wage rates which have been predetermined and are on file with the California Department of Industrial Relations are referenced but not printed in the general prevailing wage rates.

If there is a difference between the minimum wage rates predetermined by the United States Secretary of Labor and the general prevailing wage rates determined by the Director of the California Department of Industrial Relations for similar classifications of labor, the Contractor and subcontractors shall pay not less than the higher wage rate. The Department will not accept lower State wage rates not specifically included in the Federal minimum wage determinations. This includes "helper" (or other classifications based on hours of experience) or any other classification not appearing in the Federal wage determinations. Where Federal wage determinations do not contain the State wage rate determination otherwise available for use by the Contractor and subcontractors, the Contractor and subcontractors shall pay not less than the Federal minimum wage rate which most closely approximates the duties of the employees in question.

DEPARTMENT OF TRANSPORTATION

Deputy Director Transportation Engineering

Dated July 14, 2003

HZ

**COPY OF ENGINEER'S ESTIMATE**  
**(NOT TO BE USED FOR BIDDING PURPOSES)**  
**03-375604**

Item	Item Code	Item	Unit of Measure	Estimated Quantity
1	070012	PROGRESS SCHEDULE (CRITICAL PATH METHOD)	LS	LUMP SUM
2	070018	TIME-RELATED OVERHEAD	WDAY	360
3	072005	TEMPORARY BRIDGE	LS	LUMP SUM
4	074019	PREPARE STORM WATER POLLUTION PREVENTION PLAN	LS	LUMP SUM
5	074020	WATER POLLUTION CONTROL	LS	LUMP SUM
6	031602	HYDROCARBON SAMPLING AND ANALYSIS	LS	LUMP SUM
7 (S)	120090	CONSTRUCTION AREA SIGNS	LS	LUMP SUM
8 (S)	120100	TRAFFIC CONTROL SYSTEM	LS	LUMP SUM
9	120120	TYPE III BARRICADE	EA	39
10 (S)	120149	TEMPORARY PAVEMENT MARKING (PAINT)	M2	33
11 (S)	120151	TEMPORARY TRAFFIC STRIPE (TAPE)	M	4500
12 (S)	120159	TEMPORARY TRAFFIC STRIPE (PAINT)	M	120
13 (S)	120165	CHANNELIZER (SURFACE MOUNTED)	EA	530
14	031603	TRAFFIC PLASTIC DRUM	EA	57
15	120300	TEMPORARY PAVEMENT MARKER	EA	1370
16 (S)	128650	PORTABLE CHANGEABLE MESSAGE SIGN	LS	LUMP SUM
17	129000	TEMPORARY RAILING (TYPE K)	M	4270
18	129100	TEMPORARY CRASH CUSHION MODULE	EA	97
19	150206	ABANDON CULVERT	EA	10
20	150662	REMOVE METAL BEAM GUARD RAILING	M	23

Item	Item Code	Item	Unit of Measure	Estimated Quantity
21	150668	REMOVE FLARED END SECTION	EA	6
22	031604	REMOVE YELLOW TRAFFIC STRIPE	M	2220
23	031605	REMOVE WHITE TRAFFIC STRIPE	M	540
24	150742	REMOVE ROADSIDE SIGN	EA	56
25	150760	REMOVE SIGN STRUCTURE	EA	1
26	150767	REMOVE BRIDGE MOUNTED SIGN	EA	1
27	150805	REMOVE CULVERT	M	280
28	150820	REMOVE INLET	EA	14
29	150821	REMOVE HEADWALL	EA	1
30	150826	REMOVE MANHOLE	EA	2
31	150829	REMOVE RETAINING WALL	M	34
32	150860	REMOVE BASE AND SURFACING	M3	460
33	152390	RELOCATE ROADSIDE SIGN	EA	12
34 (S)	153151	COLD PLANE ASPHALT CONCRETE PAVEMENT (25 MM MAXIMUM)	M2	17 700
35 (S)	031606	COLD PLANE ASPHALT CONCRETE PAVEMENT (50 MM MAXIMUM)	M2	14 900
36	153210	REMOVE CONCRETE	M3	190
37	153221	REMOVE CONCRETE BARRIER	M	28
38	160101	CLEARING AND GRUBBING	LS	LUMP SUM
39	190101	ROADWAY EXCAVATION	M3	37 000
40	190110	LEAD COMPLIANCE PLAN	LS	LUMP SUM

Item	Item Code	Item	Unit of Measure	Estimated Quantity
41 (F)	192003	STRUCTURE EXCAVATION (BRIDGE)	M3	1363
42 (F)	049439	STRUCTURE EXCAVATION (TUNNEL) (TYPE D)	M3	43 600
43 (F)	049440	STRUCTURE EXCAVATION (TUNNEL) (TYPE DH)	M3	2440
44 (F)	192037	STRUCTURE EXCAVATION (RETAINING WALL)	M3	5282
45 (F)	193003	STRUCTURE BACKFILL (BRIDGE)	M3	913
46 (F)	193006	STRUCTURE BACKFILL (SLURRY CEMENT)	M3	2990
47 (F)	193013	STRUCTURE BACKFILL (RETAINING WALL)	M3	903
48	193031	PERVIOUS BACKFILL MATERIAL (RETAINING WALL)	M3	95
49 (F)	193039	STRUCTURE BACKFILL (TUNNEL)	M3	4420
50 (F)	197021	EARTH RETAINING STRUCTURE, LOCATION A	M2	196
51 (F)	197022	EARTH RETAINING STRUCTURE, LOCATION B	M2	175
52 (F)	200101	IMPORTED TOPSOIL	M3	324
53 (S)	200114	ROCK BLANKET	M2	300
54 (S)	203003	STRAW (EROSION CONTROL)	TONN	10
55 (S)	203014	FIBER (EROSION CONTROL)	KG	2400
56 (S)	203024	COMPOST (EROSION CONTROL)	KG	7500
57 (S)	203026	MOVE-IN/MOVE-OUT (EROSION CONTROL)	EA	8
58 (S)	203045	PURE LIVE SEED (EROSION CONTROL)	KG	40
59 (S)	203056	COMMERCIAL FERTILIZER (EROSION CONTROL)	KG	340
60 (S)	203061	STABILIZING EMULSION (EROSION CONTROL)	KG	300

Item	Item Code	Item	Unit of Measure	Estimated Quantity
61 (S)	208731	200 MM CORRUGATED HIGH DENSITY POLYETHYLENE PIPE CONDUIT	M	160
62 (S)	208732	250 MM CORRUGATED HIGH DENSITY POLYETHYLENE PIPE CONDUIT	M	220
63	220101	FINISHING ROADWAY	LS	LUMP SUM
64	260201	CLASS 2 AGGREGATE BASE	TONN	48 800
65	390155	ASPHALT CONCRETE (TYPE A)	TONN	16 400
66	390165	ASPHALT CONCRETE (OPEN GRADED)	TONN	2180
67	391031	PAVING ASPHALT (BINDER-PAVEMENT REINFORCING FABRIC)	TONN	20
68	393001	PAVEMENT REINFORCING FABRIC	M2	16 500
69	394002	PLACE ASPHALT CONCRETE (MISCELLANEOUS AREA)	M2	1700
70	394040	PLACE ASPHALT CONCRETE DIKE (TYPE A)	M	200
71	394042	PLACE ASPHALT CONCRETE DIKE (TYPE B)	M	740
72	394048	PLACE ASPHALT CONCRETE DIKE (TYPE E)	M	1080
73	394049	PLACE ASPHALT CONCRETE DIKE (TYPE F)	M	640
74	491007	FURNISH PILING (CLASS 400)	M	286
75 (S)	491008	DRIVE PILE (CLASS 400)	EA	32
76 (S)	500001	PRESTRESSING CAST-IN-PLACE CONCRETE	LS	LUMP SUM
77 (F)	510051	STRUCTURAL CONCRETE, BRIDGE FOOTING	M3	409
78 (F)	510053	STRUCTURAL CONCRETE, BRIDGE	M3	982
79 (F)	510056	STRUCTURAL CONCRETE, TUNNEL	M3	8810
80 (F)	510060	STRUCTURAL CONCRETE, RETAINING WALL	M3	631

Item	Item Code	Item	Unit of Measure	Estimated Quantity
81 (F)	510072	STRUCTURAL CONCRETE, BARRIER SLAB	M3	167
82 (F)	510502	MINOR CONCRETE (MINOR STRUCTURE)	M3	68
83 (F)	049441	ARCHITECTURAL TEXTURE	M2	1289
84	518051	PTFE SPHERICAL BEARING	EA	8
85 (S)	519128	JOINT SEAL ASSEMBLY (MR 100 MM)	M	16
86 (S-F)	520102	BAR REINFORCING STEEL (BRIDGE)	KG	188 600
87 (S-F)	520103	BAR REINFORCING STEEL (RETAINING WALL)	KG	17 453
88 (S-F)	520109	BAR REINFORCING (TUNNEL)	KG	852 600
89 (S-F)	049442	PREFORMED MEMBRANE WATERPROOFING (TUNNEL)	M2	12 060
90 (F)	560203	FURNISH SIGN STRUCTURE (BRIDGE MOUNTED WITH WALKWAY)	KG	3277
91 (S-F)	560204	INSTALL SIGN STRUCTURE (BRIDGE MOUNTED WITH WALKWAY)	KG	3277
92 (F)	560218	FURNISH SIGN STRUCTURE (TRUSS)	KG	26 244
93 (S-F)	560219	INSTALL SIGN STRUCTURE (TRUSS)	KG	26 244
94 (S)	561008	760 MM CAST-IN-DRILLED-HOLE CONCRETE PILE (SIGN FOUNDATION)	M	18
95 (S)	561009	920 MM CAST-IN-DRILLED-HOLE CONCRETE PILE (SIGN FOUNDATION)	M	28
96 (S)	031607	ROADSIDE SIGN (BRIDGE RAIL MOUNTED)	KG	104
97	566011	ROADSIDE SIGN - ONE POST	EA	64
98	566012	ROADSIDE SIGN - TWO POST	EA	6
99	568001	INSTALL SIGN (STRAP AND SADDLE BRACKET METHOD)	EA	26
100 (S)	568016	INSTALL SIGN PANEL ON EXISTING FRAME	M2	72

Item	Item Code	Item	Unit of Measure	Estimated Quantity
101 (S)	049443	PREPARING AND PAINTING CONCRETE (TUNNEL)	LS	LUMP SUM
102	620904	300 MM ALTERNATIVE PIPE CULVERT	M	83
103	620909	450 MM ALTERNATIVE PIPE CULVERT	M	740
104	620913	600 MM ALTERNATIVE PIPE CULVERT	M	510
105	620924	900 MM ALTERNATIVE PIPE CULVERT	M	38
106	620930	1050 MM ALTERNATIVE PIPE CULVERT	M	74
107	650367	525 MM REINFORCED CONCRETE PIPE (CLASS III)	M	37
108 (S)	049444	TUNNEL DRAINAGE SYSTEM	LS	LUMP SUM
109	680931	150 MM PERFORATED PLASTIC PIPE UNDERDRAIN	M	220
110	681066	150 MM PLASTIC PIPE	M	170
111	681990	FILTER FABRIC	M2	380
112	705223	525 MM CONCRETE FLARED END SECTION	EA	1
113	705334	300 MM ALTERNATIVE FLARED END SECTION	EA	2
114	705336	450 MM ALTERNATIVE FLARED END SECTION	EA	6
115	705337	600 MM ALTERNATIVE FLARED END SECTION	EA	5
116	705339	900 MM ALTERNATIVE FLARED END SECTION	EA	2
117	705340	1050 MM ALTERNATIVE FLARED END SECTION	EA	2
118	707051	DRAINAGE MANHOLE	EA	10
119	721009	ROCK SLOPE PROTECTION (FACING, METHOD B)	M3	12
120	729010	ROCK SLOPE PROTECTION FABRIC	M2	33



Item	Item Code	Item	Unit of Measure	Estimated Quantity
121	731502	MINOR CONCRETE (MISCELLANEOUS CONSTRUCTION)	M3	470
122	731519	MINOR CONCRETE (STAMPED CONCRETE)	M2	1280
123 (S)	740500	DRAINAGE PUMPING EQUIPMENT	LS	LUMP SUM
124 (S)	741001	PUMPING PLANT ELECTRICAL EQUIPMENT	LS	LUMP SUM
125 (S-F)	750001	MISCELLANEOUS IRON AND STEEL	KG	7760
126 (S-F)	750501	MISCELLANEOUS METAL (BRIDGE)	KG	700
127 (S-F)	049445	MISCELLANEOUS METAL (TUNNEL)	KG	400
128 (S-F)	750520	PUMPING PLANT METAL WORK	KG	2940
129 (S-F)	800711	PICKET FENCING	M	430
130 (S)	810116	SURVEY MONUMENT (TYPE D)	EA	8
131	031608	CONCRETE BARRIER DELINEATOR (400 MM)	EA	22
132	820107	DELINEATOR (CLASS 1)	EA	120
133	031609	DELINEATOR (CLASS 1, SURFACE MOUNTED)	EA	15
134	031610	HIGHWAY POST MARKER	EA	4
135	820141	OBJECT MARKER (TYPE K-1)	EA	6
136	820151	OBJECT MARKER (TYPE L-1)	EA	2
137 (S)	832003	METAL BEAM GUARD RAILING (WOOD POST)	M	830
138 (F)	833142	CONCRETE BARRIER (TYPE 26 MODIFIED)	M	289
139 (S)	839310	DOUBLE THRIE BEAM BARRIER	M	53
140	839402	CONCRETE BARRIER (SPECIAL)	M	96

Item	Item Code	Item	Unit of Measure	Estimated Quantity
141 (S-F)	839521	CABLE RAILING	M	898
142 (S)	839559	TERMINAL SYSTEM (TYPE ET)	EA	9
143 (S)	839565	TERMINAL SYSTEM (TYPE SRT)	EA	2
144 (S)	839568	TERMINAL ANCHOR ASSEMBLY (TYPE SFT)	EA	7
145 (S)	839603	CRASH CUSHION (ADIEM)	EA	3
146	839704	CONCRETE BARRIER (TYPE 60D)	M	270
147	031611	CONCRETE BARRIER (TYPE 60 MODIFIED)	M	210
148	839705	CONCRETE BARRIER (TYPE 60E)	M	28
149 (F)	049446	CONCRETE BARRIER (TYPE 60A MODIFIED)	M	247
150 (F)	049447	CONCRETE BARRIER (TYPE 60D MODIFIED)	M	216
151 (F)	839720	CONCRETE BARRIER (TYPE 732)	M	187
152 (F)	839717	CONCRETE BARRIER (TYPE 732 MODIFIED)	M	145
153 (F)	049448	CONCRETE BARRIER (TYPE 742)	M	165
154 (S)	840515	THERMOPLASTIC PAVEMENT MARKING	M2	310
155 (S)	840561	100 MM THERMOPLASTIC TRAFFIC STRIPE	M	11 100
156 (S)	840563	200 MM THERMOPLASTIC TRAFFIC STRIPE	M	2300
157 (S)	840564	200 MM THERMOPLASTIC TRAFFIC STRIPE (BROKEN 3.66 M - 0.92 M)	M	240
158 (S)	840570	100 MM THERMOPLASTIC TRAFFIC STRIPE (BROKEN 10.98 M - 3.66 M)	M	2200
159 (S)	840571	100 MM THERMOPLASTIC TRAFFIC STRIPE (BROKEN 5.18 M - 2.14 M)	M	800
160 (S)	850101	PAVEMENT MARKER (NON-REFLECTIVE)	EA	2800

Item	Item Code	Item	Unit of Measure	Estimated Quantity
161 (S)	850111	PAVEMENT MARKER (RETROREFLECTIVE)	EA	1780
162 (S)	860251	SIGNAL AND LIGHTING (LOCATION 1)	LS	LUMP SUM
163 (S)	860252	SIGNAL AND LIGHTING (LOCATION 2)	LS	LUMP SUM
164 (S)	860253	SIGNAL AND LIGHTING (LOCATION 3)	LS	LUMP SUM
165 (S)	049449	ELECTRICAL WORK (OPERATIONS BUILDING AND TUNNEL)	LS	LUMP SUM
166 (S)	860551	LIGHTING AND SIGN ILLUMINATION (LOCATION 1)	LS	LUMP SUM
167 (S)	860552	LIGHTING AND SIGN ILLUMINATION (LOCATION 2)	LS	LUMP SUM
168 (S)	860553	LIGHTING AND SIGN ILLUMINATION (LOCATION 3)	LS	LUMP SUM
169 (S)	860554	LIGHTING AND SIGN ILLUMINATION (LOCATION 4)	LS	LUMP SUM
170 (S)	860555	LIGHTING AND SIGN ILLUMINATION (LOCATION 5)	LS	LUMP SUM
171 (S)	860556	LIGHTING AND SIGN ILLUMINATION (LOCATION 6)	LS	LUMP SUM
172 (S)	860557	LIGHTING AND SIGN ILLUMINATION (LOCATION 7)	LS	LUMP SUM
173 (S)	861101	RAMP METERING SYSTEM (LOCATION 1)	LS	LUMP SUM
174 (S)	861102	RAMP METERING SYSTEM (LOCATION 2)	LS	LUMP SUM
175 (S)	861103	RAMP METERING SYSTEM (LOCATION 3)	LS	LUMP SUM
176 (S)	031612	REMOVE EXISTING SIGNAL EQUIPMENT (LOCATION 1)	LS	LUMP SUM
177 (S)	031613	REMOVE EXISTING SIGNAL EQUIPMENT (LOCATION 2)	LS	LUMP SUM
178 (S)	031614	WATER SUPPLY SYSTEM	LS	LUMP SUM
179 (S)	049450	MECHANICAL WORK (OPERATIONS BUILDING AND TUNNEL)	LS	LUMP SUM
180	049451	OPERATIONS BUILDING	LS	LUMP SUM

Item	Item Code	Item	Unit of Measure	Estimated Quantity
181	049452	HINGED DOORS AND HARDWARE	LS	LUMP SUM
182	999990	MOBILIZATION	LS	LUMP SUM

**STATE OF CALIFORNIA**  
**DEPARTMENT OF TRANSPORTATION**

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**SPECIAL PROVISIONS**

**Annexed to Contract No. 03-375604**

**SECTION 1. SPECIFICATIONS AND PLANS**

The work embraced herein shall conform to the provisions in the Standard Specifications dated July 1999, and the Standard Plans dated July 1999, of the Department of Transportation insofar as the same may apply, and these special provisions.

The District in which the work for this project is located has been incorporated into the Department's Northern Region. References in the Standard Specifications or in these special provisions to the district shall be deemed to mean the Northern Region. The office of the District Director for the Northern Region is located at Marysville.

In case of conflict between the Standard Specifications and these special provisions, the special provisions shall take precedence over and shall be used in lieu of the conflicting portions.

**AMENDMENTS TO JULY 1999 STANDARD SPECIFICATIONS**

**UPDATED JUNE 19, 2003**

Amendments to the Standard Specifications set forth in these special provisions shall be considered as part of the Standard Specifications for the purposes set forth in Section 5-1.04, "Coordination and Interpretation of Plans, Standard Specifications and Special Provisions," of the Standard Specifications. Whenever either the term "Standard Specifications is amended" or the term "Standard Specifications are amended" is used in the special provisions, the text or table following the term shall be considered an amendment to the Standard Specifications. In case of conflict between such amendments and the Standard Specifications, the amendments shall take precedence over and be used in lieu of the conflicting portions.

**SECTION 2: PROPOSAL REQUIREMENTS AND CONDITIONS**

Issue Date: June 19, 2003

Section 2-1.03, "Examination of Plans, Specifications, Contract, and Site of Work," of the Standard Specifications is amended to read:

**2-1.03 Examination of Plans, Specifications, Contract, and Site of Work**

- The bidder shall examine carefully the site of the work contemplated, the plans and specifications, and the proposal and contract forms therefor. The submission of a bid shall be conclusive evidence that the bidder has investigated and is satisfied as to the general and local conditions to be encountered, as to the character, quality and scope of work to be performed, the quantities of materials to be furnished and as to the requirements of the proposal, plans, specifications and the contract.
- The submission of a bid shall also be conclusive evidence that the bidder is satisfied as to the character, quality and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information was reasonably ascertainable from an inspection of the site and the records of exploratory work done by the Department as shown in the bid documents, as well as from the plans and specifications made a part of the contract.
- Where the Department has made investigations of site conditions including subsurface conditions in areas where work is to be performed under the contract, or in other areas, some of which may constitute possible local material sources,

Contract No. 03-375604

bidders or contractors may, upon written request, inspect the records of the Department as to those investigations subject to and upon the conditions hereinafter set forth.

- Where there has been prior construction by the Department or other public agencies within the project limits, records of the prior construction that are currently in the possession of the Department and which have been used by, or are known to, the designers and administrators of the project will be made available for inspection by bidders or contractors, upon written request, subject to the conditions hereinafter set forth. The records may include, but are not limited to, as-built drawings, design calculations, foundation and site studies, project reports and other data assembled in connection with the investigation, design, construction and maintenance of the prior projects.

- Inspection of the records of investigations and project records may be made at the office of the district in which the work is situated, or in the case of records of investigations related to structure work, at the Transportation Laboratory in Sacramento, California.

- When a log of test borings or other record of geotechnical data obtained by the Department's investigation of surface and subsurface conditions is included with the contract plans, it is furnished for the bidders' or Contractor's information and its use shall be subject to the conditions and limitations set forth in this Section 2-1.03.

- In some instances, information considered by the Department to be of possible interest to bidders or contractors has been compiled as "Materials Information." The use of the "Materials Information" shall be subject to the conditions and limitations set forth in this Section 2-1.03 and Section 6-2, "Local Materials."

- When cross sections are not included with the plans, but are available, bidders or contractors may inspect the cross sections and obtain copies for their use, at their expense.

- When cross sections are included with the contract plans, it is expressly understood and agreed that the cross sections do not constitute part of the contract, do not necessarily represent actual site conditions or show location, character, dimensions and details of work to be performed, and are included in the plans only for the convenience of bidders and their use is subject to the conditions and limitations set forth in this Section 2-1.03.

- When contour maps were used in the design of the project, the bidders may inspect those maps, and if available, they may obtain copies for their use.

- The availability or use of information described in this Section 2-1.03 is not to be construed in any way as a waiver of the provisions of the first paragraph in this Section 2-1.03 and bidders and contractors are cautioned to make independent investigations and examinations as they deem necessary to be satisfied as to conditions to be encountered in the performance of the work and, with respect to possible local material sources, the quality and quantity of material available from the property and the type and extent of processing that may be required in order to produce material conforming to the requirements of the specifications.

- The Department assumes no responsibility for conclusions or interpretations made by a bidder or contractor based on the information or data made available by the Department. The Department does not assume responsibility for representation made by its officers or agents before the execution of the contract concerning surface or subsurface conditions, unless that representation is expressly stated in the contract.

- No conclusions or interpretations made by a bidder or contractor from the information and data made available by the Department will relieve a bidder or contractor from properly fulfilling the terms of the contract.

## **SECTION 5: CONTROL OF WORK**

Issue Date: December 31, 2001

Section 5-1.02A, "Trench Excavation Safety Plans," of the Standard Specifications is amended to read:

### **5-1.02A Excavation Safety Plans**

- The Construction Safety Orders of the Division of Occupational Safety and Health shall apply to all excavations. For all excavations 1.5 m or more in depth, the Contractor shall submit to the Engineer a detailed plan showing the design and details of the protective systems to be provided for worker protection from the hazard of caving ground during excavation. The detailed plan shall include any tabulated data and any design calculations used in the preparation of the plan. Excavation shall not begin until the detailed plan has been reviewed and approved by the Engineer.

- Detailed plans of protective systems for which the Construction Safety Orders require design by a registered professional engineer shall be prepared and signed by an engineer who is registered as a Civil Engineer in the State of California, and shall include the soil classification, soil properties, soil design calculations that demonstrate adequate stability of the protective system, and any other design calculations used in the preparation of the plan.

- No plan shall allow the use of a protective system less effective than that required by the Construction Safety Orders.

- If the detailed plan includes designs of protective systems developed only from the allowable configurations and

slopes, or Appendices, contained in the Construction Safety Orders, the plan shall be submitted at least 5 days before the Contractor intends to begin excavation. If the detailed plan includes designs of protective systems developed from tabulated data, or designs for which design by a registered professional engineer is required, the plan shall be submitted at least 3 weeks before the Contractor intends to begin excavation.

- Attention is directed to Section 7-1.01E, "Trench Safety."

## **SECTION 9: MEASUREMENT AND PAYMENT**

Issue Date: November 18, 2002

Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications is amended to read:

### **9-1.04 NOTICE OF POTENTIAL CLAIM**

- It is the intention of this section that disputes between the parties arising under and by virtue of the contract be brought to the attention of the Engineer at the earliest possible time in order that the matters may be resolved, if possible, or other appropriate action promptly taken.

- Disputes will not be considered unless the Contractor has first complied with specified notice or protest requirements, including Section 4-1.03, "Changes," Section 5-1.116, "Differing Site Conditions," Section 8-1.06, "Time of Completion," Section 8-1.07, "Liquidated Damages," and Section 8-1.10, "Utility and Non-Highway Facilities."

- For disputes arising under and by virtue of the contract, including an act or failure to act by the Engineer, the Contractor shall provide a signed written initial notice of potential claim to the Engineer within 5 days from the date the dispute first arose. The initial notice of potential claim shall provide the nature and circumstances involved in the dispute which shall remain consistent through the dispute. The initial notice of potential claim shall be submitted on Form CEM-6201A furnished by the Department and shall be certified with reference to the California False Claims Act, Government Code Sections 12650-12655. The Contractor shall assign an exclusive identification number for each dispute, determined by chronological sequencing, based on the date of the dispute.

- The exclusive identification number for each dispute shall be used on the following corresponding documents:

- A. Initial notice of potential claim.
- B. Supplemental notice of potential claim.
- C. Full and final documentation of potential claim.
- D. Corresponding claim included in the Contractor's written statement of claims.

- The Contractor shall provide the Engineer the opportunity to examine the site of work within 5 days from the date of the initial notice of potential claim. The Contractor shall proceed with the performance of contract work unless otherwise specified or directed by the Engineer.

- Throughout the disputed work, the Contractor shall maintain records that provide a clear distinction between the incurred direct costs of disputed work and that of undisputed work. The Contractor shall allow the Engineer access to the Contractor's project records deemed necessary by the Engineer to evaluate the potential claim within 20 days of the date of the Engineer's written request.

- Within 15 days of submitting the initial notice of potential claim, the Contractor shall provide a signed supplemental notice of potential claim to the Engineer that provides the following information:

- A. The complete nature and circumstances of the dispute which caused the potential claim.
- B. The contract provisions that provide the basis of claim.
- C. The estimated cost of the potential claim, including an itemized breakdown of individual costs and how the estimate was determined.
- D. A time impact analysis of the project schedule that illustrates the effect on the scheduled completion date due to schedule changes or disruptions where a request for adjustment of contract time is made.

- The information provided in items A and B above shall provide the Contractor's complete reasoning for additional compensation or adjustments.

- The supplemental notice of potential claim shall be submitted on Form CEM-6201B furnished by the Department and shall be certified with reference to the California False Claims Act, Government Code Sections 12650-12655. The Engineer will evaluate the information presented in the supplemental notice of potential claim and provide a written response to the Contractor within 20 days of its receipt. If the estimated cost or effect on the scheduled completion date changes, the Contractor shall update information in items C and D above as soon as the change is recognized and submit this information

to the Engineer.

- Within 30 days of the completion of work related to the potential claim, the Contractor shall provide the full and final documentation of potential claim to the Engineer that provides the following information:

- A. A detailed factual narration of events fully describing the nature and circumstances that caused the dispute, including, but not limited to, necessary dates, locations, and items of work affected by the dispute.
- B. The specific provisions of the contract that support the potential claim and a statement of the reasons these provisions support and provide a basis for entitlement of the potential claim.
- C. When additional monetary compensation is requested, the exact amount requested calculated in conformance with Section 9-1.03, "Force Account Payment," or Section 8-1.09, "Right of Way Delays," including an itemized breakdown of individual costs. These costs shall be segregated into the following cost categories:

1. Labor – A listing of individuals, classifications, regular hours and overtime hours worked, dates worked, and other pertinent information related to the requested reimbursement of labor costs.
2. Materials – Invoices, purchase orders, location of materials either stored or incorporated into the work, dates materials were transported to the project or incorporated into the work, and other pertinent information related to the requested reimbursement of material costs.
3. Equipment – Listing of detailed description (make, model, and serial number), hours of use, dates of use and equipment rates. Equipment rates shall be at the applicable State rental rate as listed in the Department of Transportation publication entitled "Labor Surcharge and Equipment Rental Rates," in effect when the affected work related to the dispute was performed.
4. Other categories as specified by the Contractor or the Engineer.

- D. When an adjustment of contract time is requested the following information shall be provided:

1. The specific dates for which contract time is being requested.
2. The specific reasons for entitlement to a contract time adjustment.
3. The specific provisions of the contract that provide the basis for the requested contract time adjustment.
4. A detailed time impact analysis of the project schedule. The time impact analysis shall show the effect of changes or disruptions on the scheduled completion date to demonstrate entitlement to a contract time adjustment.

- E. The identification and copies of the Contractor's documents and the substance of oral communications that support the potential claim.

- The full and final documentation of the potential claim shall be submitted on Form CEM-6201C furnished by the Department and shall be certified with reference to the California False Claims Act, Government Code Sections 12650-12655.

- Pertinent information, references, arguments, and data to support the potential claim shall be included in the full and final documentation of potential claim. Information submitted subsequent to the full and final documentation submittal will not be considered. Information required in the full and final documentation of potential claim, as listed in items A to E above, that is not applicable to the dispute may be exempted as determined by the Engineer. No full and final documentation of potential claim will be considered that does not have the same nature and circumstances, and basis of claim as those specified on the initial and supplemental notices of potential claim.

- The Engineer will evaluate the information presented in the full and final documentation of potential claim and provide a written response to the Contractor within 30 days of its receipt unless otherwise specified. The Engineer's receipt of the full and final documentation of potential claim shall be evidenced by postal receipt or the Engineer's written receipt if delivered by hand. If the full and final documentation of potential claim is submitted by the Contractor after acceptance of the work by the Director, the Engineer need not provide a written response.

- Provisions in this section shall not apply to those claims for overhead costs and administrative disputes that occur after issuance of the proposed final estimate. Administrative disputes are disputes of administrative deductions or retentions, contract item quantities, contract item adjustments, interest payments, protests of contract change orders as provided in Section 4-1.03A, "Procedure and Protest," and protests of the weekly statement of working days as provided in Section 8-1.06, "Time of Completion." Administrative disputes that occur prior to issuance of the proposed final estimate shall follow applicable requirements of this section. Information listed in the supplemental notice and full and final documentation of potential claim that is not applicable to the administrative dispute may be exempted as determined by the Engineer.

- Unless otherwise specified in the special provisions, the Contractor may pursue the administrative claim process



pursuant to Section 9-1.07B, "Final Payment and Claims," for any potential claim found by the Engineer to be without merit.

- Failure of the Contractor to conform to specified dispute procedures shall constitute a failure to pursue diligently and exhaust the administrative procedures in the contract, and is deemed as the Contractor's waiver of the potential claim and a waiver of the right to a corresponding claim for the disputed work in the administrative claim process in conformance with Section 9-1.07B, "Final Payment of Claims," and shall operate as a bar to arbitration pursuant to Section 10240.2 of the California Public Contract Code.

Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications is amended to read:

#### **9-1.07B Final Payment and Claims**

- After acceptance by the Director, the Engineer will make a proposed final estimate in writing of the total amount payable to the Contractor, including an itemization of the total amount, segregated by contract item quantities, extra work and other bases for payment, and shall also show each deduction made or to be made for prior payments and amounts to be kept or retained under the provisions of the contract. Prior estimates and payments shall be subject to correction in the proposed final estimate. The Contractor shall submit written approval of the proposed final estimate or a written statement of claims arising under or by virtue of the contract so that the Engineer receives the written approval or statement of claims no later than close of business of the thirtieth day after receiving the proposed final estimate. If the thirtieth day falls on a Saturday, Sunday or legal holiday, then receipt of the written approval or statement of claims by the Engineer shall not be later than close of business of the next business day. The Contractor's receipt of the proposed final estimate shall be evidenced by postal receipt. The Engineer's receipt of the Contractor's written approval or statement of claims shall be evidenced by postal receipt or the Engineer's written receipt if delivered by hand.

- On the Contractor's approval, or if the Contractor files no claim within the specified period of 30 days, the Engineer will issue a final estimate in writing in conformance with the proposed final estimate submitted to the Contractor, and within 30 days thereafter the State will pay the entire sum so found to be due. That final estimate and payment thereon shall be conclusive and binding against both parties to the contract on all questions relating to the amount of work done and the compensation payable therefor, except as otherwise provided in Sections 9-1.03C, "Records," and 9-1.09, "Clerical Errors."

- If the Contractor within the specified period of 30 days files claims, the Engineer will issue a semifinal estimate in conformance with the proposed final estimate submitted to the Contractor and within 30 days thereafter the State will pay the sum found to be due. The semifinal estimate and corresponding payment shall be conclusive and binding against both parties to the contract on each question relating to the amount of work done and the compensation payable therefor, except insofar as affected by the claims filed within the time and in the manner required hereunder and except as otherwise provided in Sections 9-1.03C, "Records," and 9-1.09, "Clerical Errors."

- Except for claims for overhead costs and administrative disputes that occur after issuance of the proposed final estimate, the Contractor shall only provide the following two items of information for each claim:

- A. The exclusive identification number that corresponds to the supporting full and final documentation of potential claim.
- B. The final amount of requested additional compensation.

- If the final amount of requested additional compensation is different than the amount of requested compensation included in the full and final documentation of potential claim, the Contractor shall provide in the written statement of claims the reasons for the changed amount, the specific provisions of the contract which support the changed amount, and a statement of the reasons the provisions support and provide a basis for the changed amount. If the Contractor's claim fails to provide an exclusive identification number or if there is a disparity in the provided exclusive identification number, the Engineer will notify the Contractor of the omission or disparity. The Contractor shall have 15 days after receiving notification from the Engineer to correct the omission or disparity. If after the 15 days has elapsed, there is still an omission or disparity of the exclusive identification number assigned to the claim, the Engineer will assign the number. No claim will be considered that has any of the following deficiencies:

- A. The claim does not have the same nature, circumstances, and basis as the corresponding full and final documentation of potential claim.
- B. The claim does not have a corresponding full and final documentation of potential claim.
- C. The claim was not included in the written statement of claims.
- D. The Contractor did not comply with applicable notice or protest requirements of Sections 4-1.03, "Changes," 5-1.116, "Differing Site Condition," 8-1.06, "Time of Completion," 8-1.07, "Liquidated Damages," 8-1.10, "Utility and Non-Highway Facilities," and 9-1.04, "Notice of Potential Claim."

- Administrative disputes that occur after issuance of the proposed final estimate shall be included in the Contractor's written statement of claims in sufficient detail to enable the Engineer to ascertain the basis and amounts of those claims.
- The Contractor shall keep full and complete records of the costs and additional time incurred for work for which a claim for additional compensation is made. The Engineer or designated claim investigators or auditors shall have access to those records and any other records as may be required by the Engineer to determine the facts or contentions involved in the claims. Failure to permit access to those records shall be sufficient cause for denying the claims.
- The written statement of claims submitted by the Contractor shall be accompanied by a notarized certificate containing the following language:

Under the penalty of law for perjury or falsification and with specific reference to the California False Claims Act, Government Code Section 12650 et. seq., the undersigned,

\_\_\_\_\_  
*(name)* \_\_\_\_\_ of  
 \_\_\_\_\_  
*(title)* \_\_\_\_\_  
 \_\_\_\_\_  
*(company)*

hereby certifies that the claim for the additional compensation and time, if any, made herein for the work on this contract is a true statement of the actual costs incurred and time sought, and is fully documented and supported under the contract between parties.

Dated \_\_\_\_\_

/s/ \_\_\_\_\_

Subscribed and sworn before me this \_\_\_\_\_ day

of \_\_\_\_\_

\_\_\_\_\_  
*(Notary Public)*

My Commission

Expires \_\_\_\_\_

- Failure to submit the notarized certificate will be sufficient cause for denying the claim.
- Claims for overhead type expenses or costs, in addition to being certified as stated above, shall be supported and accompanied by an audit report of an independent Certified Public Accountant. Omission of a supporting audit report of an independent Certified Public Accountant shall result in denial of the claim and shall operate as a bar to arbitration, as to the claim, in conformance with the requirements in Section 10240.2 of the California Public Contract Code. Claims for overhead type expenses or costs shall be subject to audit by the State at its discretion. The costs of performing an audit examination and submitting the report shall be borne by the Contractor. The Certified Public Accountant's audit examination shall be performed in conformance with the requirements of the American Institute of Certified Public Accountants Attestation Standards. The audit examination and report shall depict the Contractor's project and company-wide financial records and shall specify the actual overall average daily rates for both field and home office overhead for the entire duration of the project, and whether the costs have been properly allocated. The rates of field and home office overhead shall exclude unallowable costs as determined in Title 48 of the Federal Acquisition Regulations, Chapter 1, Part 31. The audit examination and report shall determine if the rates of field and home office overhead are:

- Allowable in conformance with the requirements in Title 48 of the Federal Acquisition Regulations, Chapter 1, Part 31.
- Adequately supported by reliable documentation.
- Related solely to the project under examination.

- Costs or expenses incurred by the State in reviewing or auditing claims that are not supported by the Contractor's

cost accounting or other records shall be deemed to be damages incurred by the State within the meaning of the California False Claims Act.

- If the Contractor files a timely written statement of claims in response to the proposed final estimate, the District that administers the contract will submit a claim position letter to the Contractor by hand delivery or deposit in the U.S. mail within 135 days of acceptance of the contract. The claim position letter will delineate the District's position on the Contractor's claims. If the Contractor disagrees with the claim position letter, the Contractor shall submit a written notification of its disagreement and a written request to meet with the board of review, to be received by the District not later than 15 days after the Contractor's receipt of the claim position letter. The written notification of disagreement shall set forth the basis for the Contractor's disagreement and be submitted to the office designated in the claim position letter. The Contractor's failure to provide a timely written notification of disagreement or timely written request to meet with the board of review shall constitute the Contractor's acceptance and agreement with the determinations provided in the claim position letter and with final payment pursuant to the claim position letter.

- If the Contractor files a timely notification of disagreement with the District claim position letter and a timely request to meet with the board of review, then the board of review, designated by the District Director to review claims that remain in dispute, will meet with the Contractor within 45 days after receipt by the District of the notification of disagreement.

- If the District fails to submit a claim position letter to the Contractor within 135 days after the acceptance of the contract and the Contractor has claims that remain in dispute, the Contractor may request a meeting with the board of review designated by the District Director to review claims that remain in dispute. The Contractor's request for a meeting shall identify the claims that remain in dispute. If the Contractor files a request for a meeting, the board of review will meet with the Contractor within 45 days after the District receives the request for the meeting.

- Attendance by the Contractor at the board of review meeting shall be mandatory. The board of review will review those claims and make a written recommendation thereon to the District Director. The final determination of claims, made by the District Director, will be sent to the Contractor by hand delivery or deposit in the U.S. mail. The Engineer will then make and issue the Engineer's final estimate in writing and within 30 days thereafter the State will pay the entire sum, if any, found due thereon. That final estimate shall be conclusive and binding against both parties to the contract on all questions relating to the amount of work done and the compensation payable therefor, except as otherwise provided in Sections 9-1.03C, "Records," and 9-1.09, "Clerical Errors."

- Failure of the Contractor to conform to the specified dispute procedures shall constitute a failure to pursue diligently and exhaust the administrative procedures in the contract and shall operate as a bar to arbitration in conformance with the requirements in Section 10240.2 of the California Public Contract Code.

## **SECTION 19: EARTHWORK**

Issue Date: December 31, 2001

The third paragraph of Section 19-1.02, "Preservation of Property," of the Standard Specifications is amended to read:

- In addition to the provisions in Sections 5-1.02, "Plans and Working Drawings," and 5-1.02A, "Excavation Safety Plans," detailed plans of the protective systems for excavations on or affecting railroad property will be reviewed for adequacy of protection provided for railroad facilities, property, and traffic. These plans shall be submitted at least 9 weeks before the Contractor intends to begin excavation requiring the protective systems. Approval by the Engineer of the detailed plans for the protective systems will be contingent upon the plans being satisfactory to the railroad company involved.

## **SECTION 42: GROOVE AND GRIND PAVEMENT**

Issue Date: December 31, 2001

The last sentence of the first subparagraph of the third paragraph in Section 42-2.02, "Construction," of the Standard Specifications is amended to read:

After grinding has been completed, the pavement shall conform to the straightedge and profile requirements specified in Section 40-1.10, "Final Finishing."

## **SECTION 49: PILING**

Issue Date: April 30, 2003

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The first paragraph in Section 49-1.03, "Determination of Length," of the Standard Specifications is amended to read:

- Foundation piles of any material shall be of such length as is required to develop the nominal resistance, to obtain the specified penetration, and to extend into the cap or footing block as shown on the plans, or specified in the special provisions.

The fourth paragraph in Section 49-1.03, "Determination of Length," of the Standard Specifications is amended to read:

- Modification to the specified installation methods and specified pile tip elevation will not be considered at locations where tension or lateral load demands control design pile tip elevations or when the plans state that specified pile tip elevation shall not be revised.

The sixth and seventh paragraphs in Section 49-1.03, "Determination of Length," of the Standard Specifications are amended to read:

- Indicator compression pile load testing shall conform to the requirements in ASTM Designation: D 1143. The pile shall sustain the first compression test load applied which is equal to the nominal resistance in compression, as shown on the plans, with no more than 13 mm total vertical movement at the top of the pile measured relative to the top of the pile prior to the start of compression load testing.
- Indicator tension pile load testing shall conform to the requirements in ASTM Designation: D 3689. The loading apparatus described as "Load Applied to Pile by Hydraulic Jack(s) Acting at One End of Test Beam(s) Anchored to the Pile" shall not be used. The pile shall sustain the first tension test load applied which is equal to the nominal resistance in tension, as shown on the plans, with no more than 13 mm total vertical movement at the top of the pile measured relative to the top of the pile prior to the start of tension load testing.

The ninth paragraph in Section 49-1.03, "Determination of Length," of the Standard Specifications is amended to read:

- For driven piling, the Contractor shall furnish piling of sufficient length to obtain both the specified tip elevation and nominal resistance shown on the plans or specified in the special provisions. For cast-in-drilled-hole concrete piling, the Contractor shall construct piling of such length to develop the nominal resistance in compression and to obtain the specified tip elevation shown on the plans or specified in the special provisions.

The tenth paragraph in Section 49-1.03, "Determination of Length," of the Standard Specifications is deleted.

The fourth paragraph in Section 49-1.04, "Load Test Piles," of the Standard Specifications is amended to read:

- Load test piles and anchor piles which are not to be incorporated in the completed structure shall be removed in conformance with the provisions in Section 15-4.02, "Removal Methods," and the remaining holes shall be backfilled with earth or other suitable material approved by the Engineer.

The first paragraph in Section 49-1.05, "Driving Equipment," of the Standard Specifications is amended to read:

- Driven piles shall be installed with impact hammers that are approved in writing by the Engineer. Impact hammers shall be steam, hydraulic, air or diesel hammers. Impact hammers shall develop sufficient energy to drive the piles at a penetration rate of not less than 3 mm per blow at the specified nominal resistance.

The seventh paragraph in Section 49-1.05, "Driving Equipment," of the Standard Specifications is amended to read:

- When necessary to obtain the specified penetration and when authorized by the Engineer, the Contractor may supply and operate one or more water jets and pumps, or furnish the necessary drilling apparatus and drill holes not greater than the least dimension of the pile to the proper depth and drive the piles therein. Jets shall not be used at locations where the stability of embankments or other improvements would be endangered. In addition, for steel piles, steel shells, or steel casings, when necessary to obtain the specified penetration or to prevent damage to the pile during installation, the Contractor shall provide special driving tips or heavier pile sections or take other measures as approved by the Engineer.

- The use of followers or underwater hammers for driving piles will be permitted if authorized in writing by the Engineer. When a follower or underwater hammer is used, its efficiency shall be verified by furnishing the first pile in each

bent or footing sufficiently long and driving the pile without the use of a follower or underwater hammer.

Section 49-1.08, "Bearing Value and Penetration," of the Standard Specifications is amended to read:

#### **49-1.08 PILE DRIVING ACCEPTANCE CRITERIA**

- Except for piles to be load tested, driven piles shall be driven to a value of not less than the nominal resistance shown on the plans unless otherwise specified in the special provisions or permitted in writing by the Engineer. In addition, when a pile tip elevation is specified, driven piles shall penetrate at least to the specified tip elevation, unless otherwise permitted in writing by the Engineer. Piles to be load tested shall be driven to the specified tip elevation.
- When the pile nominal resistance is omitted from the plans or the special provisions, timber piles shall be driven to a nominal resistance of 800 kN, and steel and concrete piles shall be driven to a nominal resistance of 1250 kN.
- The nominal resistance for driven piles shall be determined from the following formula in which " $R_u$ " is the nominal resistance in kilonewtons, " $E_r$ " is the manufacturer's rating for joules of energy developed by the hammer at the observed field drop height, and "N" is the number of hammer blows in the last 300 millimeters. (maximum value to be used for N is 100):

$$R_u = (7 * (E_r)^{1/2} * \log_{10} (0.83 * N)) - 550$$

Section 49-3.01, "Description," of the Standard Specifications is amended by deleting the fifth paragraph.

The sixth paragraph in Section 49-4.01, "Description," of the Standard Specifications is amended to read:

- Lifting anchors used in precast prestressed concrete piles without a class designation ending in "C" (corrosion resistant) shall be removed, and the holes filled in conformance with the provisions in Section 51-1.18A, "Ordinary Surface Finish."

The first and second paragraphs in Section 49-4.01, "Description," of the Standard Specifications are amended to read:

- Cast-in-place concrete piles shall consist of one of the following:
  - A. Steel shells driven permanently to the required nominal resistance and penetration and filled with concrete.
  - B. Steel casings installed permanently to the required penetration and filled with concrete.
  - C. Drilled holes filled with concrete.
  - D. Rock sockets filled with concrete.
- The drilling of holes shall conform to the provisions in these specifications. Concrete filling for cast-in-place concrete piles is designated by compressive strength and shall have a minimum 28-day compressive strength of 25 MPa. At the option of the Contractor, the combined aggregate grading for the concrete shall be either the 25-mm maximum grading, the 12.5-mm maximum grading, or the 9.5-mm maximum grading. Concrete shall conform to the provisions in Section 90, "Portland Cement Concrete," and Section 51, "Concrete Structures." Reinforcement shall conform to the provisions in Section 52, "Reinforcement."

The fourth paragraph in Section 49-4.03, "Drilled Holes," of the Standard Specifications is amended to read:

- After placing reinforcement and prior to placing concrete in the drilled hole, if caving occurs or deteriorated foundation material accumulates on the bottom of the hole, the bottom of the drilled hole shall be cleaned. The Contractor shall verify that the bottom of the drilled hole is clean.

The first and second paragraphs in Section 49-4.04, "Steel Shells," of the Standard Specifications are amended to read:

- Steel shells shall be sufficiently watertight to exclude water during the placing of concrete. The shells may be cylindrical or tapered, step-tapered, or a combination of either, with cylindrical sections.

The first paragraph in Section 49-4.05, "Inspection," of the Standard Specifications is amended to read:

- After being driven and prior to placing reinforcement and concrete therein, the steel shells shall be examined for collapse or reduced diameter at any point. Any shell which is improperly driven or broken or shows partial collapse to such an extent as to materially decrease its nominal resistance will be rejected. Rejected shells shall be removed and replaced, or a new shell shall be driven adjacent to the rejected shell. Rejected shells which cannot be removed shall be filled with concrete by the Contractor at the Contractor's expense. When a new shell is driven to replace a rejected shell, the Contractor, at the Contractor's expense, shall enlarge the footing as determined necessary by the Engineer.

The third paragraph in Section 49-6.02, "Payment," of the Standard Specifications is amended to read:

- The contract price paid per meter for cast-in-drilled-hole concrete piling shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in drilling holes, disposing of material resulting from drilling holes, temporarily casing holes and removing water when necessary, furnishing and placing concrete and reinforcement, and constructing reinforced concrete extensions, complete in place, to the required penetration, as shown on the plans, as specified in these specifications and in the special provisions, and as directed by the Engineer.

The seventh paragraph in Section 49-6.02, "Payment," of the Standard Specifications is amended to read:

- The contract unit price paid for drive pile shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in driving timber, concrete and steel piles, driving steel shells for cast-in-place concrete piles, placing filling materials for cast-in-place concrete piles and cutting off piles, all complete in place to the required nominal resistance and penetration as shown on the plans and as specified in these specifications and the special provisions, and as directed by the Engineer.

The ninth paragraph in Section 49-6.02, "Payment," of the Standard Specifications is amended to read:

- Full compensation for all jetting, drilling, providing special driving tips or heavier sections for steel piles or shells, or other work necessary to obtain the specified penetration and nominal resistance of the piles, for predrilling holes through embankment and filling the space remaining around the pile with sand or pea gravel, for disposing of material resulting from jetting, drilling or predrilling holes, and for all excavation and backfill involved in constructing concrete extensions as shown on the plans, and as specified in these specifications and the special provisions, and as directed by the Engineer shall be considered as included in the contract unit price paid for drive pile or in the contract price paid per meter for cast-in-drilled-hole concrete piling, and no additional compensation will be allowed therefor.

Section 49-6.02, "Payment," of the Standard Specifications is amended by adding the following paragraphs:

Full compensation for furnishing and placing additional testing reinforcement, for load test anchorages, and for cutting off test piles, shall be considered as included in the contract price paid for piling of the type or class shown in the Engineer's Estimate, and no additional compensation will be allowed.

No additional compensation or extension of time will be made for additional foundation investigation, installation and testing of indicator piling, cutting off piling and restoring the foundation investigation and indicator pile sites, and review of request by the Engineer

## **SECTION 50: PRESTRESSING CONCRETE**

Issue Date: November 18, 2002

Section 50-1.02, "Drawings," of the Standard Specifications is amended by adding the following paragraph after the second paragraph:

- Each working drawing submittal shall consist of plans for a single bridge or portion thereof. For multi-frame bridges, each frame shall require a separate working drawing submittal.

Section 50-1.05, "Prestressing Steel," of the Standard Specifications is amended to read:

- Prestressing steel shall be high-tensile wire conforming to the requirements in ASTM Designation: A 421,  
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including Supplement I; high-tensile seven-wire strand conforming to the requirements in ASTM Designation: A 416; or uncoated high-strength steel bars conforming to the requirements in ASTM Designation: A 722, including all supplementary requirements. The maximum mass requirement of ASTM Designation: A 722 will not apply.

- In addition to the requirements of ASTM Designation: A 722, for deformed bars, the reduction of area shall be determined from a bar from which the deformations have been removed. The bar shall be machined no more than necessary to remove the deformations over a length of 300 mm, and reduction will be based on the area of the machined portion.

- In addition to the requirements specified herein, epoxy-coated seven-wire prestressing steel strand shall be grit impregnated and filled in conformance with the requirements in ASTM Designation: A 882/A 882M, including Supplement I, and the following:

- A. The coating material shall be on the Department's list of approved coating materials for epoxy-coated strand, available from the Transportation Laboratory.
- B. The film thickness of the coating after curing shall be 381  $\mu\text{m}$  to 1143  $\mu\text{m}$ .
- C. Prior to coating the strand, the Contractor shall furnish to the Transportation Laboratory a representative 230-g sample from each batch of epoxy coating material to be used. Each sample shall be packaged in an airtight container identified with the manufacturer's name and batch number.
- D. Prior to use of the epoxy-coated strand in the work, written certifications referenced in ASTM Designation: A 882/A 882M, including a representative load-elongation curve for each size and grade of strand to be used and a copy of the quality control tests performed by the manufacturer, shall be furnished to the Engineer.
- E. In addition to the requirements in Section 50-1.10, "Samples for Testing," four 1.5-m long samples of coated strand and one 1.5-m long sample of uncoated strand of each size and reel shall be furnished to the Engineer for testing. These samples, as selected by the Engineer, shall be representative of the material to be used in the work.
- F. Epoxy-coated strand shall be cut using an abrasive saw.
- G. All visible damage to coatings caused by shipping and handling, or during installation, including cut ends, shall be repaired in conformance with the requirements in ASTM Designation: A 882/A 882M. The patching material shall be furnished by the manufacturer of the epoxy powder and shall be applied in conformance with the manufacturer's written recommendations. The patching material shall be compatible with the original epoxy coating material and shall be inert in concrete.

- All bars in any individual member shall be of the same grade, unless otherwise permitted by the Engineer.

- When bars are to be extended by the use of couplers, the assembled units shall have a tensile strength of not less than the manufacturer's minimum guaranteed ultimate tensile strength of the bars. Failure of any one sample to meet this requirement will be cause for rejection of the heat of bars and lot of couplers. The location of couplers in the member shall be subject to approval by the Engineer.

- Wires shall be straightened if necessary to produce equal stress in all wires or wire groups or parallel lay cables that are to be stressed simultaneously or when necessary to ensure proper positioning in the ducts.

- Where wires are to be button-headed, the buttons shall be cold formed symmetrically about the axes of the wires. The buttons shall develop the minimum guaranteed ultimate tensile strength of the wire. No cold forming process shall be used that causes indentations in the wire. Buttonheads shall not contain wide open splits, more than 2 splits per head, or splits not parallel with the axis of the wire.

- Prestressing steel shall be protected against physical damage and rust or other results of corrosion at all times from manufacture to grouting or encasing in concrete. Prestressing steel that has sustained physical damage at any time shall be rejected. The development of visible rust or other results of corrosion shall be cause for rejection, when ordered by the Engineer.

- Epoxy-coated prestressing steel strand shall be covered with an opaque polyethylene sheeting or other suitable protective material to protect the strand from exposure to sunlight, salt spray, and weather. For stacked coils, the protective covering shall be draped around the perimeter of the stack. The covering shall be adequately secured; however, it should allow for air circulation around the strand to prevent condensation under the covering. Epoxy-coated strand shall not be stored within 300 m of ocean or tidal water for more than 2 months.

- Prestressing steel shall be packaged in containers or shipping forms for the protection of the steel against physical damage and corrosion during shipping and storage. Except for epoxy-coated strand, a corrosion inhibitor which prevents rust or other results of corrosion, shall be placed in the package or form, or shall be incorporated in a corrosion inhibitor carrier type packaging material, or when permitted by the Engineer, may be applied directly to the steel. The corrosion inhibitor shall have no deleterious effect on the steel or concrete or bond strength of steel to concrete. Packaging or forms damaged from any cause shall be immediately replaced or restored to original condition.

- The shipping package or form shall be clearly marked with a statement that the package contains high-strength prestressing steel, and the type of corrosion inhibitor used, including the date packaged.

- Prestressing steel for post-tensioning which is installed in members prior to placing and curing of the concrete, and

which is not epoxy-coated, shall be continuously protected against rust or other results of corrosion, until grouted, by means of a corrosion inhibitor placed in the ducts or applied to the steel in the duct. The corrosion inhibitor shall conform to the provisions specified herein.

- When steam curing is used, prestressing steel for post-tensioning shall not be installed until the steam curing is completed.

- Water used for flushing ducts shall contain either quick lime (calcium oxide) or slaked lime (calcium hydroxide) in the amount of 0.01-kg/L. Compressed air used to blow out ducts shall be oil free.

- When prestressing steel for post-tensioning is installed in the ducts after completion of concrete curing, and if stressing and grouting are completed within 10 days after the installation of the prestressing steel, rust which may form during those 10 days will not be cause for rejection of the steel. Prestressing steel installed, tensioned, and grouted in this manner, all within 10 days, will not require the use of a corrosion inhibitor in the duct following installation of the prestressing steel. Prestressing steel installed as above but not grouted within 10 days shall be subject to all the requirements in this section pertaining to corrosion protection and rejection because of rust. The requirements in this section pertaining to tensioning and grouting within 10 days shall not apply to epoxy-coated prestressing steel strand.

- Any time prestressing steel for pretensioning is placed in the stressing bed and is exposed to the elements for more than 36 hours prior to encasement in concrete, adequate measures shall be taken by the Contractor, as approved by the Engineer, to protect the steel from contamination or corrosion.

- After final fabrication of the seven-wire prestressing steel strand, no electric welding of any form shall be performed on the prestressing steel. Whenever electric welding is performed on or near members containing prestressing steel, the welding ground shall be attached directly to the steel being welded.

- Pretensioned prestressing steel shall be cut off flush with the end of the member. For epoxy-coated prestressing steel, only abrasive saws shall be used to cut the steel. The exposed ends of the prestressing steel and a 25-mm strip of adjoining concrete shall be cleaned and painted. Cleaning shall be by wire brushing or abrasive blast cleaning to remove all dirt and residue on the metal or concrete surfaces. Immediately after cleaning, the surfaces shall be covered with one application of unthinned zinc-rich primer (organic vehicle type) conforming to the provisions in Section 91, "Paint," except that 2 applications shall be applied to surfaces which will not be covered by concrete or mortar. Aerosol cans shall not be used. The paint shall be thoroughly mixed at the time of application and shall be worked into any voids in the prestressing tendons.

The thirteenth paragraph in Section 50-1.08, "Prestressing," of the Standard Specifications is amended to read:

- Prestressing steel in pretensioned members shall not be cut or released until the concrete in the member has attained a compressive strength of not less than the value shown on the plans or 28 MPa, whichever is greater. In addition to these concrete strength requirements, when epoxy-coated prestressing steel strand is used, the steel shall not be cut or released until the temperature of the concrete surrounding the strand is less than 65°C, and falling.

The fifth paragraph in Section 50-1.10, "Samples for Testing," of the Standard Specifications is amended to read:

- The following samples of materials and tendons, selected by the Engineer from the prestressing steel at the plant or jobsite, shall be furnished by the Contractor to the Engineer well in advance of anticipated use:

- A. For wire or bars, one 2-m long sample and for strand, one 1.5-m long sample, of each size shall be furnished for each heat or reel.

- B. For epoxy-coated strand, one 1.5-m long sample of uncoated strand of each size shall be furnished for each reel.

- C. If the prestressing tendon is a bar, one 2-m long sample shall be furnished and in addition, if couplers are to be used with the bar, two 1.25-m long samples of bar, equipped with one coupler and fabricated to fit the coupler, shall be furnished.

The second paragraph in Section 50-1.11, "Payment," of the Standard Specifications is amended to read:

- The contract lump sum prices paid for prestressing cast-in-place concrete of the types listed in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in furnishing, placing, and tensioning the prestressing steel in cast-in-place concrete structures, complete in place, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.



## SECTION 51: CONCRETE STRUCTURES

Issue Date: April 16, 2003

The first and second paragraph in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications are amended to read:

- The Contractor shall submit to the Engineer working drawings and design calculations for falsework proposed for use at bridges. For bridges where the height of any portion of the falsework, as measured from the ground line to the soffit of the superstructure, exceeds 4.25 m; or where any individual falsework clear span length exceeds 4.85 m; or where provision for vehicular, pedestrian, or railroad traffic through the falsework is made; the drawings shall be signed by an engineer who is registered as a Civil Engineer in the State of California. Six sets of the working drawings and 2 copies of the design calculations shall be furnished. Additional working drawings and design calculations shall be submitted to the Engineer when specified in "Railroad Relations and Insurance" of the special provisions.
- The falsework drawings shall include details of the falsework erection and removal operations showing the methods and sequences of erection and removal and the equipment to be used. The details of the falsework erection and removal operations shall demonstrate the stability of all or any portions of the falsework during all stages of the erection and removal operations.

The seventh paragraph in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications is amended to read:

- In the event that several falsework plans are submitted simultaneously, or an additional plan is submitted for review before the review of a previously submitted plan has been completed, the Contractor shall designate the sequence in which the plans are to be reviewed. In such event, the time to be provided for the review of any plan in the sequence shall be not less than the review time specified above for that plan, plus 2 weeks for each plan of higher priority which is still under review. A falsework plan submittal shall consist of plans for a single bridge or portion thereof. For multi-frame bridges, each frame shall require a separate falsework plan submittal.

Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications is amended by adding the following paragraphs:

- If structural composite lumber is proposed for use, the falsework drawings shall clearly identify the structural composite lumber members by grade (E value), species, and type. The Contractor shall provide technical data from the manufacturer showing the tabulated working stress values of the composite lumber. The Contractor shall furnish a certificate of compliance as specified in Section 6-1.07, "Certificates of Compliance," for each delivery of structural composite lumber to the project site.
- For falsework piles with a calculated loading capacity greater than 900 kN, the falsework piles shall be designed by an engineer who is registered as either a Civil Engineer or a Geotechnical Engineer in the State of California, and the calculations shall be submitted to the Engineer.

The first paragraph in Section 51-1.06A(1), "Design Loads," of the Standard Specifications is amended to read:

- The design load for falsework shall consist of the sum of dead and live vertical loads, and an assumed horizontal load. The minimum total design load for any falsework, including members that support walkways, shall be not less than  $4800 \text{ N/m}^2$  for the combined live and dead load regardless of slab thickness.

The eighth paragraph in Section 51-1.06A(1), "Design Loads," of the Standard Specifications is amended to read:

- In addition to the minimum requirements specified in this Section 51-1.06A, falsework for box girder structures with internal falsework bracing systems using flexible members capable of withstanding tensile forces only, shall be designed to include the vertical effects caused by the elongation of the flexible member and the design horizontal load combined with the dead and live loads imposed by concrete placement for the girder stems and connected bottom slabs. Falsework comprised of individual steel towers with bracing systems using flexible members capable of withstanding tensile forces only to resist overturning, shall be exempt from these additional requirements.

The third paragraph in Section 51-1.06B, "Falsework Construction," of the Standard Specifications is amended to read:

- When falsework is supported on piles, the piles shall be driven and the actual nominal resistance assessed in conformance with the provisions in Section 49, "Piling."

Section 51-1.06B, "Falsework Construction," of the Standard Specifications is amended by adding the following paragraphs:

- For falsework piles with a calculated nominal resistance greater than 1800 kN, the Contractor shall conduct dynamic monitoring of pile driving and generate field acceptance criteria based on a wave equation analysis. These analyses shall be signed by an engineer who is registered as a Civil Engineer in the State of California and submitted to the Engineer prior to completion of falsework erection.
- Prior to the placement of falsework members above the stringers, the final bracing system for the falsework shall be installed.

Section 51-1.06C, "Removing Falsework," of the Standard Specifications is amended by adding the following paragraph:

- The falsework removal operation shall be conducted in such a manner that any portion of the falsework not yet removed remains in a stable condition at all times.

The sixth paragraph in Section 51-1.09, "Placing Concrete," of the Standard Specifications is amended to read:

- Vibrators used to consolidate concrete containing epoxy-coated bar reinforcement or epoxy-coated prestressing steel shall have a resilient covering to prevent damage to the epoxy-coating on the reinforcement or prestressing steel.

The table in the ninth paragraph of Section 51-1.12H(1), "Plain and Fabric Reinforced Elastomeric Bearing Pads," of the Standard Specifications is amended to read:

Tensile strength, percent	-15
Elongation at break, percent	-40; but not less than 300% total elongation of the material
Hardness, points	+10

The first sentence of the fourth paragraph in Section 51-1.17, "Finish Bridge Decks," of the Standard Specifications is amended to read:

- The smoothness of completed roadway surfaces of structures, approach slabs and the adjacent 15 m of approach pavement, and the top surfaces of concrete decks which are to be covered with another material, will be tested by the Engineer with a bridge profilograph in conformance with the requirements in California test 547 and the requirements herein.

Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications is amended by deleting the seventh, thirteenth and fourteenth paragraphs.

The fourteenth paragraph in Section 51-1.23, "Payment," of the Standard Specifications is amended by deleting "and injecting epoxy in cracks".

## SECTION 52: REINFORCEMENT

Issue Date: December 31, 2001

The third paragraph in Section 52-1.04, "Inspection," of the Standard Specifications is amended to read:

- A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall also be furnished for each shipment of epoxy-coated bar reinforcement or wire reinforcement certifying that the coated reinforcement conforms to the requirements in ASTM Designation: A 775/A 775M or A 884/A 884M, respectively, and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement." The Certificate of Compliance shall include all of the

certifications specified in ASTM Designation: A 775/A 775M or A 884/A 884M respectively, and a statement that the coating material has been prequalified by acceptance testing performed by the Valley Forge Laboratories, Inc., Devon, Pennsylvania.

The third paragraph in Section 52-1.08C, "Mechanical Butt Splices," of the Standard Specifications is amended to read:

- The total slip of the reinforcing bars within the splice sleeve after loading in tension to 200 MPa and relaxing to 20 MPa shall not exceed the values listed in the following table. The slip shall be measured between gage points that are clear of the splice sleeve.

Reinforcing Bar Number	Total Slip (μm)
13	250
16	250
19	250
22	350
25	350
29	350
32	450
36	450
43	600
57	750

The first paragraph in Section 52-1.08C(5), "Sleeve-Lockshear Bolt Mechanical Butt Splices," of the Standard Specifications is amended to read:

- The sleeve-lockshear bolt type of mechanical butt splices shall consist of a seamless steel sleeve, center hole with centering pin, and bolts that are tightened until the bolt heads shear off with the bolt ends left embedded in the reinforcing bars. The seamless steel sleeve shall be either formed into a V configuration or shall have 2 serrated steel strips welded to the inside of the sleeve.

Section 52-1.08F, "Nondestructive Splice Tests," of the Standard Specifications is amended by deleting the seventh paragraph.

## **SECTION 55: STEEL STRUCTURES**

Issue Date: December 31, 2001

Section 55-3.14, "Bolted Connections," of the Standard Specifications is amended by adding the following after the ninth paragraph:

- If a torque multiplier is used in conjunction with a calibrated wrench as a method for tightening fastener assemblies to the required tension, both the multiplier and the wrench shall be calibrated together as a system. The same length input and output sockets and extensions that will be used in the work shall also be included in the calibration of the system. The manufacturer's torque multiplication ratio shall be adjusted during calibration of the system, such that when this adjusted ratio is multiplied by the actual input calibrated wrench reading, the product is a calculated output torque that is within 2 percent of the true output torque. When this system is used in the work to perform any installation tension testing, rotational capacity testing, fastener tightening, or tension verification, it shall be used, intact as calibrated.

The sixth paragraph of Section 55-4.02, "Payment," of the Standard Specifications is amended to read:

- If a portion or all of the structural steel is fabricated more than 480 air line kilometers from both Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Whereas it is and will be impracticable and extremely difficult to ascertain and determine the actual increase in these expenses, it is agreed that payment to the Contractor for furnishing the structural steel from each fabrication site located more than 480 air line kilometers from both Sacramento and Los Angeles will be reduced \$5000 or by an amount computed at \$0.044 per kilogram of structural steel fabricated, whichever is greater, or in the case of each fabrication site located more than 4800 air line kilometers from both

Sacramento and Los Angeles, payment will be reduced \$8000 or by \$0.079 per kilogram of structural steel fabricated, whichever is greater.

## **SECTION 56: SIGNS**

Issue Date: December 31, 2001

Section 56-1.01, "Description," of the Standard Specifications is amended by deleting the third paragraph.

The sixth through the thirteenth paragraphs in Section 56-1.03, "Fabrication," of the Standard Specifications are amended to read:

- High-strength bolted connections, where shown on the plans, shall conform to the provisions in Section 55-3.14, "Bolted Connections," except that only fastener assemblies consisting of a high-strength bolt, nut, hardened washer, and direct tension indicator shall be used.
- High-strength fastener assemblies, and any other bolts, nuts, and washers attached to sign structures shall be zinc-coated by the mechanical deposition process.
- An alternating snugging and tensioning pattern for anchor bolts and high-strength bolted splices shall be used. Once tensioned, high-strength fastener components and direct tension indicators shall not be reused.
- For bolt diameters less than 10 mm, the diameter of the bolt hole shall be not more than 0.80-mm larger than the nominal bolt diameter. For bolt diameters greater than or equal to 10 mm, the diameter of the bolt hole shall be not more than 1.6 mm larger than the nominal bolt diameter.
- Sign structures shall be fabricated into the largest practical sections prior to galvanizing.
- Ribbed sheet metal panels for box beam closed truss sign structures shall be fastened to the truss members by cap screws or bolts as shown on the plans, or by 4.76 mm stainless steel blind rivets conforming to Industrial Fasteners Institute, Standard IFI-114, Grade 51. The outside diameter of the large flange rivet head shall be not less than 15.88 mm in diameter. Web splices in ribbed sheet metal panels may be made with similar type blind rivets of a size suitable for the thickness of material being connected.
- Spalling or chipping of concrete structures shall be repaired by the Contractor at the Contractor's expense.
- Overhead sign supports shall have an aluminum identification plate permanently attached near the base, adjacent to the traffic side on one of the vertical posts, using either stainless steel rivets or stainless steel screws. As a minimum, the information on the plate shall include the name of the manufacturer, the date of manufacture and the contract number.

## **SECTION 59: PAINTING**

Issue Date: December 31, 2001

Section 59-2.01, "General," of the Standard Specifications is amended by adding the following paragraphs after the first paragraph:

- Unless otherwise specified, no painting Contractors or subcontractors will be permitted to commence work without having the following current "SSPC: The Society for Protective Coatings" (formerly the Steel Structures Painting Council) certifications in good standing:
  - A. For cleaning and painting structural steel in the field, certification in conformance with the requirements in Qualification Procedure No. 1, "Standard Procedure For Evaluating Painting Contractors (Field Application to Complex Industrial Structures)" (SSPC-QP 1).
  - B. For removing paint from structural steel, certification in conformance with the requirements in Qualification Procedure No. 2, "Standard Procedure For Evaluating Painting Contractors (Field Removal of Hazardous Coatings from Complex Structures)" (SSPC-QP 2).
  - C. For cleaning and painting structural steel in a permanent painting facility, certification in conformance with the requirements in Qualification Procedure No. 3, "Standard Procedure For Evaluating Qualifications of Shop Painting Applicators" (SSPC-QP 3). The AISC's Sophisticated Paint Endorsement (SPE) quality program will be considered equivalent to SSPC-QP 3.

The third paragraph of Section 59-2.03, "Blast Cleaning," of the Standard Specifications is amended to read:

- Exposed steel or other metal surfaces to be blast cleaned shall be cleaned in conformance with the requirements in Surface Preparation Specification No. 6, "Commercial Blast Cleaning," of the "SSPC: The Society for Protective Coatings." Blast cleaning shall leave all surfaces with a dense, uniform, angular anchor pattern of not less than 35  $\mu\text{m}$  as measured in conformance with the requirements in ASTM Designation: D 4417.

The first paragraph of Section 59-2.06, "Hand Cleaning," of the Standard Specifications is amended to read:

- Dirt, loose rust and mill scale, or paint which is not firmly bonded to the surfaces shall be removed in conformance with the requirements in Surface Preparation Specification No. 2, "Hand Tool Cleaning," of the "SSPC: The Society for Protective Coatings." Edges of old remaining paint shall be feathered.

The fourth paragraph of Section 59-2.12, "Painting," of the Standard Specifications is amended to read:

- The dry film thickness of the paint will be measured in place with a calibrated Type 2 magnetic film thickness gage in conformance with the requirements of specification SSPC-PA2 of the "SSPC: The Society for Protective Coatings."

## SECTION 75: MISCELLANEOUS METAL

Issue Date: December 31, 2001

The table in the tenth paragraph of Section 75-1.02, "Miscellaneous Iron and Steel," of the Standard Specifications is amended to read:

Material	Specification
Steel bars, plates and shapes	ASTM Designation: A 36/A 36M or A 575, A 576 (AISI or M Grades 1016 through 1030 except Grade 1017)
Steel fastener components for general applications:	
Bolts and studs	ASTM Designation: A 307
Headed anchor bolts	ASTM Designation: A 307, Grade B, including S1 supplementary requirements
Nonheaded anchor bolts	ASTM Designation: A 307, Grade C, including S1 supplementary requirements and S1.6 of AASHTO Designation: M 314 supplementary requirements or AASHTO Designation: M 314, Grade 36 or 55, including S1 supplementary requirements
High-strength bolts and studs, threaded rods, and nonheaded anchor bolts	ASTM Designation: A 449, Type 1
Nuts	ASTM Designation: A 563, including Appendix X1*
Washers	ASTM Designation: F 844
Components of high-strength steel fastener assemblies for use in structural steel joints:	
Bolts	ASTM Designation: A 325, Type 1
Tension control bolts	ASTM Designation: F 1852, Type 1
Nuts	ASTM Designation: A 563, including Appendix X1*
Hardened washers	ASTM Designation: F 436, Type 1, Circular, including S1 supplementary requirements
Direct tension indicators	ASTM Designation: F 959, Type 325, zinc-coated
Stainless steel fasteners (Alloys 304 & 316) for general applications:	
Bolts, screws, studs, threaded rods, and nonheaded anchor bolts	ASTM Designation: F 593 or F 738M
Nuts	ASTM Designation: F 594 or F 836M
Washers	ASTM Designation: A 240/A 240M and ANSI B 18.22M
Carbon-steel castings	ASTM Designation: A 27/A 27M, Grade 65-35 [450-240], Class 1
Malleable iron castings	ASTM Designation: A 47, Grade 32510 or A 47M, Grade 22010
Gray iron castings	ASTM Designation: A 48, Class 30B
Ductile iron castings	ASTM Designation: A 536, Grade 65-45-12
Cast iron pipe	Commercial quality
Steel pipe	Commercial quality, welded or extruded
Other parts for general applications	Commercial quality

\* Zinc-coated nuts that will be tightened beyond snug or wrench tight shall

be furnished with a dyed dry lubricant conforming to Supplementary Requirement S2 in ASTM Designation: A 563.

The table in the eighteenth paragraph of Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications is amended to read:

Stud Diameter (millimeters)	Sustained Tension Test Load (kilonewtons)
29.01-33.00	137.9
23.01-29.00	79.6
21.01-23.00	64.1
* 18.01-21.00	22.2
15.01-18.00	18.2
12.01-15.00	14.2
9.01-12.00	9.34
6.00-9.00	4.23

\* Maximum stud diameter permitted for mechanical expansion anchors.

The table in the nineteenth paragraph of Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications is amended to read:

Stud Diameter (millimeters)	Ultimate Tensile Load (kilonewtons)
30.01-33.00	112.1
27.01-30.00	88.1
23.01-27.00	71.2
20.01-23.00	51.6
16.01-20.00	32.0
14.01-16.00	29.4
12.00-14.00	18.7

The table in the twenty-second paragraph of Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications is amended to read:

Installation Torque Values, (newton meters)			
Stud Diameter (millimeters)	Shell Type Mechanical Expansion Anchors	Integral Stud Type Mechanical Expansion Anchors	Resin Capsule Anchors and Cast-in-Place Inserts
29.01-33.00	—	—	540
23.01-29.00	—	—	315
21.01-23.00	—	—	235
18.01-21.00	110	235	200
15.01-18.00	45	120	100
12.01-15.00	30	65	40
9.01-12.00	15	35	24
6.00-9.00	5	10	—

## **SECTION 83: RAILINGS AND BARRIERS**

Issue Date: June 13, 2002

The ninth paragraph in Section 83-1.02B, "Metal Beam Guard Railing," of the Standard Specifications is amended to read:

- The grades and species of wood posts and blocks shall be No. 1 timbers (also known as No. 1 structural) Douglas fir or No. 1 timbers Southern yellow pine. Wood posts and blocks shall be graded in conformance with the provisions in Section 57-2, "Structural Timber," of the Standard Specifications, except allowances for shrinkage after mill cutting shall in no case exceed 5 percent of the American Lumber Standards minimum sizes, at the time of installation.

The eleventh paragraph in Section 83-1.02B, "Metal Beam Guard Railing," of the Standard Specifications is amended to read:

- Wood posts and blocks shall be pressure treated after fabrication in conformance with the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," of the Standard Specifications with creosote, creosote coal tar solution, creosote petroleum solution (50-50), pentachlorophenol in hydrocarbon solvent, copper naphthenate, ammoniacal copper arsenate, or ammoniacal copper zinc arsenate. In addition to the preservatives listed above, Southern yellow pine may also be pressure treated with chromated copper arsenate. When other than one of the creosote processes is used, blocks shall have a minimum retention of 6.4 Kg/m<sup>3</sup>, and need not be incised.

## **SECTION 85: PAVEMENT MARKERS**

Issue Date: May 16, 2003

The second through fifth paragraphs in Section 85-1.03, "Sampling, Tolerances and Packaging," of the Standard Specifications are amended to read:

### **Sampling**

- Twenty markers selected at random will constitute a representative sample for each lot of markers.
- The lot size shall not exceed 25000 markers.

### **Tolerances**

- Three test specimens will be randomly selected from the sample for each test and tested in conformance with these specifications. Should any one of the 3 specimens fail to conform with the requirements in these specifications, 6 additional specimens will be tested. The failure of any one of these 6 specimens shall be cause for rejection of the entire lot or shipment represented by the sample.
- The entire sample of retroreflective pavement markers will be tested for reflectance. The failure of 10 percent or more of the original sampling shall be cause for rejection.

Section 85-1.04, "Non-Reflective Pavement Markers," of the Standard Specifications is amended to read:

### **85-1.04 Non-Reflective Pavement Markers**

- Non-reflective pavement markers (Types A and AY) shall be, at the option of the Contractor, either ceramic or plastic conforming to these specifications.
- The top surface of the marker shall be convex with a gradual change in curvature. The top, bottom and sides shall be free of objectionable marks or discoloration that will affect adhesion or appearance.
- The bottom of markers shall have areas of integrally formed protrusions or indentations, which will increase the effective bonding surface area of adhesive. The bottom surface of the marker shall not deviate more than 1.5 mm from a flat surface. The areas of protrusion shall have faces parallel to the bottom of the marker and shall project approximately one mm from the bottom.

The second through fourth paragraphs of Section 85-1.04A, "Non-Reflective Pavement Markers (Ceramic)," of the Standard Specifications are deleted.



The table in the fifth paragraph in Section 85-1.04A, "Non-Reflective Pavement Markers (Ceramic)," of the Standard Specifications is amended to read:

#### Testing

- Tests shall be performed in conformance with the requirements in California test 669.

Test	Test Description	Requirement
a	Bond strength	4.8 MPa, min.
b	Glaze thickness	180 $\mu$ m, min.
c	Hardness	6 Moh, min.
d	Luminance factor, Type A, white markers only, glazed surface	75, min.
e	Yellowness index, Type A, white markers only, glazed surface	7, max.
f	Color-yellow, Type AY, yellow markers only. The chromaticity coordinates shall be within a color box defined in CTM 669	Pass
g	Compressive strength	6700 N, min.
h	Water absorption	2.0 %, max.
i	Artificial weathering, 500 hours exposure, yellowness index	20, max.

Section 85-1.04B, "Non-Reflective Pavement Markers (Plastic)," of the Standard Specifications is amended to read:

#### 85-1.04B Non-Reflective Pavement Markers (Plastic)

- Plastic non-reflective pavement markers Types A and AY shall be, at the option of the Contractor, either polypropylene or acrylonitrile-butadiene-styrene (ABS) plastic type.
- Plastic markers shall conform to the testing requirements specified in Section 85-1.04A, "Non-Reflective Pavement Markers (Ceramic)," except that Tests a, b, c, and h shall not apply. The plastic markers shall not be coated with substances that interfere with the ability of the adhesive bonding to the marker.

The sixth and seventh paragraphs in Section 85-1.05, "Retroreflective Pavement Markers," of the Standard Specifications are amended to read:

#### Testing

- Tests shall be performed in conformance with the requirements in California test 669.

Test Description	Requirement		
Bond strength <sup>a</sup>	3.4 MPa, min.		
Compressive strength <sup>b</sup>	8900 N, min.		
Abrasion resistance, marker must meet the respective specific intensity minimum requirements after abrasion.	Pass		
Water Soak Resistance	No delamination of the body or lens system of the marker nor loss of reflectance		
Reflectance	Specific Intensity		
	Clear	Yellow	Red
0° Incidence Angle, min.	3.0	1.5	0.75
20° Incidence Angle, min.	1.2	0.60	0.30
After one year field evaluation	0.30	0.15	0.08
a Failure of the marker body or filler material prior to reaching 3.4 MPa shall constitute a failing bond strength test.			
b Deformation of the marker of more than 3 mm at a load of less than			

8900 N or delamination of the shell and the filler material of more than 3 mm regardless of the load required to break the marker shall be cause for rejection of the markers as specified in Section 85-1.03, "Sampling, Tolerances and Packaging."

- Pavement markers to be placed in pavement recesses shall conform to the above requirements for retroreflective pavement markers except that the minimum compressive strength requirement shall be 5338 N.

The eighth paragraph of Section 85-1.05, "Retroreflective Pavement Markers" of the Standard Specifications is deleted.

The eighth paragraph in Section 85-1.06, "Replacement," of the Standard Specifications is amended to read:

- Epoxy adhesive shall not be used to apply non-reflective plastic pavement markers.

## **SECTION 86: SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS**

Issue Date: June 19, 2003

The seventh paragraph of Section 86-2.03, "Foundations," of the Standard Specifications is amended to read:

- Forms shall be true to line and grade. Tops of foundations for posts and standards, except special foundations, shall be finished to curb or sidewalk grade or as directed by the Engineer. Forms shall be rigid and securely braced in place. Conduit ends and anchor bolts shall be placed in proper position and to proper height, and anchor bolts shall be held in place by means of rigid top and bottom templates. The bottom template shall be made of steel. The bottom template shall provide proper spacing and alignment of the anchor bolts near their bottom embedded end. The bottom template shall be installed before placing footing concrete. Anchor bolts shall not be installed more than 1:40 from vertical.

Section 86-2.03, "Foundations," of the Standard Specifications is amended by deleting the eighth paragraph.

The twelfth paragraph of Section 86-2.03, "Foundations," of the Standard Specifications is amended to read:

- Plumbing of the standards shall be accomplished by adjusting the leveling nuts before placing the mortar or before the foundation is finished to final grade. Shims, or other similar devices shall not be used for plumbing or raking of posts, standards or pedestals. After final adjustments of both top nuts and leveling nuts on anchorage assemblies have been made, firm contact shall exist between all bearing surfaces of the anchor bolt nuts, washers, and the base plate.

The first paragraph of Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications is amended to read:

- Standards for traffic signals and lighting, and steel pedestals for cabinets and other similar equipment, shall be located as shown on the plans. Bolts, nuts and washers, and anchor bolts for use in signal and lighting support structures shall conform to the provisions in Section 55-2, "Materials." Except when bearing-type connections or slipbases are specified, high-strength bolted connections shall conform to the provisions in Section 55-3.14, "Bolted Connections." Welding, nondestructive testing (NDT) of welds, and acceptance and repair criteria for NDT of steel members shall conform to the requirements of AWS D1.1 and the contract special provisions.

The second paragraph of Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications is amended to read:

- On each lighting standard except Type 1, one rectangular corrosion resistant metal identification tag shall be permanently attached above the hand hole, near the base of the standard, using stainless steel rivets. On each signal pole support, two corrosion resistant metal identification tags shall be attached, one above the hand hole near the base of the vertical standard and one on the underside of the signal mast arm near the arm plate. As a minimum, the information on each identification tag shall include the name of the manufacturer, the date of manufacture, the identification number as shown on the plans, the contract number, and a unique identification code assigned by the fabricator. This number shall be traceable to a particular contract and the welds on that component, and shall be readable after the support structure is coated and installed. The lettering shall be a minimum of 7 mm high. The information may be either depressed or raised, and shall be

legible.

The fourth paragraph of Section 86-2.04, "Standards, Steel Pedestals and Posts" of the Standard Specifications is amended to read:

- Ferrous metal parts of standards, with shaft length of 4.6 m and longer, shall conform to the details shown on the plans, the provisions in Section 55, "Steel Structures," except as otherwise noted, and the following requirements:

Except as otherwise specified, standards shall be fabricated from sheet steel of weldable grade having a minimum yield strength, after fabrication, of 276 MPa.

Certified test reports which verify conformance to the minimum yield strength requirements shall be submitted to the Engineer. The test reports may be the mill test reports for the as-received steel or, when the as-received steel has a lower yield strength than required, the Contractor shall provide supportive test data which provides assurance that the Contractor's method of cold forming will consistently increase the tensile properties of the steel to meet the specified minimum yield strength. The supportive test data shall include tensile properties of the steel after cold forming for specific heats and thicknesses.

When a single-ply 8-mm thick pole is specified, a 2-ply pole with equivalent section modulus may be substituted.

Standards may be fabricated of full-length sheets or shorter sections. Each section shall be fabricated from not more than 2 pieces of sheet steel. Where 2 pieces are used, the longitudinal welded seams shall be directly opposite one another. When the sections are butt-welded together, the longitudinal welded seams on adjacent sections shall be placed to form continuous straight seams from base to top of standard.

Butt-welded circumferential joints of tubular sections requiring CJP groove welds shall be made using a metal sleeve backing ring inside each joint. The sleeve shall be 3-mm nominal thickness, or thicker, and manufactured from steel having the same chemical composition as the steel in the tubular sections to be joined. When the sections to be joined have different specified minimum yield strengths, the steel in the sleeve shall have the same chemical composition as the tubular section having the higher minimum yield strength. The width of the metal sleeve shall be consistent with the type of NDT chosen and shall be a minimum width of 25 mm. The sleeve shall be centered at the joint and be in contact with the tubular section at the point of the weld at time of fit-up.

Welds shall be continuous.

The weld metal at the transverse joint shall extend to the sleeve, making the sleeve an integral part of the joint.

During fabrication, longitudinal seams on vertical tubular members of cantilevered support structures shall be centered on and along the side of the pole that the pole plate is located. Longitudinal seams on horizontal tubular members, including signal and luminaire arms, shall be within  $\pm 45$  degrees of the bottom of the arm.

The longitudinal welds in steel tubular sections may be made by the electric resistance welding process.

Longitudinal seam welds shall have 60 percent minimum penetration, except that within 150 mm of circumferential welds, longitudinal seam welds shall be CJP groove welds. In addition, longitudinal seam welds on lighting support structures having telescopic pole segment splices shall be CJP groove welds on the female end for a length on each end equal to the designated slip fit splice length plus 150 mm.

Exposed circumferential welds, except fillet and fatigue-resistant welds, shall be ground flush ( $-0$ ,  $+2$ mm) with the base metal prior to galvanizing or painting.

Circumferential welds and base plate-to-pole welds may be repaired only one time without written permission from the Engineer.

Exposed edges of the plates that make up the base assembly shall be finished smooth and exposed corners of the plates shall be broken unless otherwise shown on the plans. Shafts shall be provided with slip-fitter shaft caps.

Flatness of surfaces of 1) base plates that are to come in contact with concrete, grout, or washers and leveling nuts 2) plates in high-strength bolted connections, 3) plates in joints where cap screws are used to secure luminaire and signal arms, and 4) plates used for breakaway slip base assemblies shall conform to the requirements of ASTM A6.

Standards shall be straight, with a permissive variation not to exceed 25 mm measured at the midpoint of a 9-m or 11-m standard and not to exceed 20 mm measured at the midpoint of a 5-m through 6-m standard. Variation shall not exceed 25 mm at a point 4.5 m above the base plate for Type 35 and Type 36 standards.

Zinc-coated nuts used on fastener assemblies having a specified preload (obtained by specifying a prescribed tension, torque value, or degree of turn) shall be provided with a colored lubricant that is clean and dry to the touch. The color of the lubricant shall be in contrast to the zinc coating on the nut so that the presence of the lubricant is visually obvious. In addition, either the lubricant shall be insoluble in water, or fastener components shall be shipped to the job site in a sealed container.

No holes shall be made in structural members unless the holes are shown on the plans or are approved in

writing by the Engineer.

Standards with an outside diameter of 300 mm or less shall be round. Standards with an outside diameter greater than 300 mm shall be round or multisided. Multisided standards shall have a minimum of 12 sides which shall be convex and shall have a minimum bend radius of 100 mm.

Mast arms for standards shall be fabricated from material as specified for standards, and shall conform to the dimensions shown on the plans.

The cast steel option for slip bases shall be fabricated from material conforming to the requirements in ASTM Designation: A 27/A 27M, Grade 70-40. Other comparable material may be used if written permission is given by the Engineer. The casting tolerances shall be in conformance with the Steel Founder's Society of America recommendations (green sand molding).

One casting from each lot of 50 castings or less shall be subject to radiographic inspection, in conformance with the requirements in ASTM Designation: E 94. The castings shall comply with the acceptance criteria severity level 3 or better for the types and categories of discontinuities in conformance with the requirements in ASTM Designations: E 186 and E 446. If the one casting fails to pass the inspection, 2 additional castings shall be radiographed. Both of these castings shall pass the inspection or the entire lot of 50 will be rejected.

Material certifications, consisting of physical and chemical properties, and radiographic films of the castings shall be filed at the manufacturer's office. These certifications and films shall be available for inspection upon request.

High-strength bolts, nuts and flat washers used to connect slip base plates shall conform to the requirements in ASTM Designation: A 325 or A 325M and shall be galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing."

Plate washers shall be fabricated by saw cutting and drilling steel plate conforming to the requirements in AISI Designation: 1018, and be galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing." Prior to galvanizing, burrs and sharp edges shall be removed and holes shall be chamfered sufficiently on each side to allow the bolt head to make full contact with the washer without tension on the bolt.

High-strength cap screws shown on the plans for attaching arms to standards shall conform to the requirements in ASTM Designation: A 325, A 325M or ASTM Designation: A 449, and shall comply with the mechanical requirements in ASTM Designation: A 325 or A 325M after galvanizing. The cap screws shall be galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing." The threads of the cap screws shall be coated with a colored lubricant that is clean and dry to the touch. The color of the lubricant shall be in contrast to the color of the zinc coating on the cap screw so that presence of the lubricant is visually obvious. In addition, either the lubricant shall be insoluble in water, or fastener components shall be shipped to the job site in a sealed container. otherwise specified, bolted connections attaching signal or luminaire arms to poles shall be considered slip critical. Galvanized faying surfaces on plates on luminaire and signal arms and matching plate surfaces on poles shall be roughened by hand using a wire brush prior to assembly and shall conform to the requirements for Class C surface conditions for slip-critical connections in "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts," a specification approved by the Research Council on Structural Connections (RCSC) of the Engineering Foundation. For faying surfaces required to be painted, the paint shall be an approved type, brand, and thickness that has been tested and approved according to the RCSC Specification as a Class B coating.

Samples of fastener components will be randomly taken from each production lot by the Engineer and submitted, along with test reports required by appropriate ASTM fastener specifications, for QA testing and evaluation. Sample sizes for each fastener component shall be as determined by the Engineer.

The seventh paragraph of 86-2.04, "Standards, Steel Pedestals and Posts" of the Standard Specifications is amended to read:

- To avoid interference of arm plate-to-tube welds with cap screw heads, and to ensure cap screw heads can be turned using conventional installation tools, fabricators shall make necessary adjustments to details prior to fabrication and properly locate the position of arm tubes on arm plates during fabrication.

Section 86-8.01, "Payment," of the Standard Specifications is amended by adding the following paragraph after the first paragraph:

- If a portion or all of the poles for signal, lighting and electrical systems pursuant to Standard Specification Section 86, "Signals, Lighting and Electrical Systems," is fabricated more than 480 air line kilometers from both-Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Whereas it is and will be impracticable and extremely difficult to ascertain and determine the actual increase in such expenses, it is agreed that payment to the Contractor for furnishing such items from each fabrication site located more than 480 air line kilometers from both Sacramento and Los

Angeles will be reduced \$5000; in addition, in the case where a fabrication site is located more than 4800 air line kilometers from both Sacramento and Los Angeles, payment will be reduced an additional \$3000 per each fabrication site (\$8000 total per site).

## **SECTION 88: ENGINEERING FABRIC**

Issue Date: January 15, 2002

Section 88-1.02, "Pavement Reinforcing Fabric," of the Standard Specifications is amended to read:

- Pavement reinforcing fabric shall be 100 percent polypropylene staple fiber fabric material, needle-punched, thermally bonded on one side, and conform to the following:

Specification	Requirement
Weight, grams per square meter ASTM Designation: D 5261	140
Grab tensile strength (25-mm grip), kilonewtons, min. in each direction ASTM Designation: D 4632	0.45
Elongation at break, percent min. ASTM Designation: D 4632	50
Asphalt retention by fabric, grams per square meter. (Residual Minimum) ASTM Designation: D 6140	900

Note: Weight, grab, elongation and asphalt retention are based on Minimum Average Roll Value (MARV)

## **SECTION 90: PORTLAND CEMENT CONCRETE**

Issue Date: June 19, 2003

Section 90, "Portland Cement Concrete," of the Standard Specifications is amended to read:

## **SECTION 90: PORTLAND CEMENT CONCRETE**

### **90-1 GENERAL**

#### **90-1.01 DESCRIPTION**

- Portland cement concrete shall be composed of cementitious material, fine aggregate, coarse aggregate, admixtures if used, and water, proportioned and mixed as specified in these specifications.

- The Contractor shall determine the mix proportions for concrete in conformance with these specifications. Unless otherwise specified, cementitious material shall be a combination of cement and mineral admixture. Cementitious material shall be either:

1. "Type IP (MS) Modified" cement; or
2. A combination of "Type II Modified" portland cement and mineral admixture; or
3. A combination of Type V portland cement and mineral admixture.

- Type III portland cement shall be used only as allowed in the special provisions or with the approval of the Engineer.

- Class 1 concrete shall contain not less than 400 kg of cementitious material per cubic meter.
- Class 2 concrete shall contain not less than 350 kg of cementitious material per cubic meter.
- Class 3 concrete shall contain not less than 300 kg of cementitious material per cubic meter.
- Class 4 concrete shall contain not less than 250 kg of cementitious material per cubic meter.
- Minor concrete shall contain not less than 325 kg of cementitious material per cubic meter unless otherwise specified in these specifications or the special provisions.

- Unless otherwise designated on the plans or specified in these specifications or the special provisions, the amount of cementitious material used per cubic meter of concrete in structures or portions of structures shall conform to the following:

Use	Cementitious Material Content (kg/m <sup>3</sup> )
Concrete designated by compressive strength:	
Deck slabs and slab spans of bridges	400 min., 475 max.
Roof sections of exposed top box culverts	400 min., 475 max.
Other portions of structures	350 min., 475 max.
Concrete not designated by compressive strength:	
Deck slabs and slab spans of bridges	400 min.
Roof sections of exposed top box culverts	400 min.
Prestressed members	400 min.
Seal courses	400 min.
Other portions of structures	350 min.
Concrete for precast members	350 min., 550 max.

- Whenever the 28-day compressive strength shown on the plans is greater than 25 MPa, the concrete shall be designated by compressive strength. If the plans show a 28-day compressive strength that is 28 MPa or greater, an additional 14 days will be allowed to obtain the specified strength. The 28-day compressive strengths shown on the plans that are 25 MPa or less are shown for design information only and are not a requirement for acceptance of the concrete.
- Concrete designated by compressive strength shall be proportioned such that the concrete will attain the strength shown on the plans or specified in the special provisions.
- Before using concrete for which the mix proportions have been determined by the Contractor, or in advance of revising those mix proportions, the Contractor shall submit in writing to the Engineer a copy of the mix design.
- Compliance with cementitious material content requirements will be verified in conformance with procedures described in California Test 518 for cement content. For testing purposes, mineral admixture shall be considered to be cement. Batch proportions shall be adjusted as necessary to produce concrete having the specified cementitious material content.
- If any concrete has a cementitious material, portland cement, or mineral admixture content that is less than the minimum required, the concrete shall be removed. However, if the Engineer determines that the concrete is structurally adequate, the concrete may remain in place and the Contractor shall pay to the State \$0.55 for each kilogram of cementitious material, portland cement, or mineral admixture that is less than the minimum required. The Department may deduct the amount from any moneys due, or that may become due, the Contractor under the contract. The deductions will not be made unless the difference between the contents required and those actually provided exceeds the batching tolerances permitted by Section 90-5, "Proportioning." No deductions will be made based on the results of California Test 518.
- The requirements of the preceding paragraph shall not apply to minor concrete or commercial quality concrete.

## 90-2 MATERIALS

### 90-2.01 CEMENT

- Unless otherwise specified, cement shall be either "Type IP (MS) Modified" cement, "Type II Modified" portland cement or Type V portland cement.
- "Type IP (MS) Modified" cement shall conform to the requirements for Type IP (MS) cement in ASTM Designation: C 595, and shall be comprised of an intimate and uniform blend of Type II cement and not more than 35 percent by mass of mineral admixture. The type and minimum amount of mineral admixture used in the manufacture of "Type IP (MS) Modified" cement shall be in conformance with the provisions in Section 90-4.08, "Required Use of Mineral Admixtures."
- "Type II Modified" portland cement shall conform to the requirements for Type II portland cement in ASTM Designation: C 150.
- In addition, "Type IP (MS) Modified" cement and "Type II Modified" portland cement shall conform to the following requirements:
  - A. The cement shall not contain more than 0.60-percent by mass of alkalis, calculated as the percentage of Na<sub>2</sub>O plus 0.658 times the percentage of K<sub>2</sub>O, when determined by either direct intensity flame photometry or by the atomic absorption method. The instrument and procedure used shall be qualified as to precision and accuracy in conformance with the requirements in ASTM Designation: C 114;

- B. The autoclave expansion shall not exceed 0.50-percent; and
- C. Mortar, containing the cement to be used and Ottawa sand, when tested in conformance with California test 527, shall not expand in water more than 0.010 percent and shall not contract in air more than 0.048 percent, except that when cement is to be used for precast prestressed concrete piling, precast prestressed concrete members, or steam cured concrete products, the mortar shall not contract in air more than 0.053 percent.

- Type III and Type V portland cements shall conform to the requirements in ASTM Designation: C 150 and the additional requirements listed above for "Type II Modified" portland cement, except that when tested in conformance with California test 527, mortar containing Type III portland cement shall not contract in air more than 0.075 percent.

- Cement used in the manufacture of cast-in-place concrete for exposed surfaces of like elements of a structure shall be from the same cement mill.

- Cement shall be protected from exposure to moisture until used. Sacked cement shall be piled to permit access for tally, inspection, and identification of each shipment.

- Adequate facilities shall be provided to assure that cement meeting the provisions specified in this Section 90-2.01 shall be kept separate from other cement in order to prevent any but the specified cement from entering the work. Safe and suitable facilities for sampling cement shall be provided at the weigh hopper or in the feed line immediately in advance of the hopper, in conformance with California test 125.

- If cement is used prior to sampling and testing as provided in Section 6-1.07, "Certificates of Compliance," and the cement is delivered directly to the site of the work, the Certificate of Compliance shall be signed by the cement manufacturer or supplier of the cement. If the cement is used in ready-mixed concrete or in precast concrete products purchased as such by the Contractor, the Certificate of Compliance shall be signed by the manufacturer of the concrete or product.

- Cement furnished without a Certificate of Compliance shall not be used in the work until the Engineer has had sufficient time to make appropriate tests and has approved the cement for use.

## **90-2.02 AGGREGATES**

- Aggregates shall be free from deleterious coatings, clay balls, roots, bark, sticks, rags, and other extraneous material.

- Natural aggregates shall be thoroughly and uniformly washed before use.

- The Contractor, at the Contractor's expense, shall provide safe and suitable facilities, including necessary splitting devices for obtaining samples of aggregates, in conformance with California test 125.

- Aggregates shall be of such character that it will be possible to produce workable concrete within the limits of water content provided in Section 90-6.06, "Amount of Water and Penetration."

- Aggregates shall have not more than 10 percent loss when tested for soundness in conformance with the requirements in California test 214. The soundness requirement for fine aggregate will be waived, provided that the durability index,  $D_f$ , of the fine aggregate is 60, or greater, when tested for durability in conformance with California test 229.

- If the results of any one or more of the Cleanness Value, Sand Equivalent, or aggregate grading tests do not meet the requirements specified for "Operating Range" but all meet the "Contract Compliance" requirements, the placement of concrete shall be suspended at the completion of the current pour until tests or other information indicate that the next material to be used in the work will comply with the requirements specified for "Operating Range."

- If the results of either or both the Cleanness Value and coarse aggregate grading tests do not meet the requirements specified for "Contract Compliance," the concrete that is represented by the tests shall be removed. However, if the Engineer determines that the concrete is structurally adequate, the concrete may remain in place, and the Contractor shall pay to the State \$4.60 per cubic meter for paving concrete and \$7.20 per cubic meter for all other concrete for the concrete represented by these tests and left in place. The Department may deduct the amount from any moneys due, or that may become due, the Contractor under the contract.

- If the results of either or both the Sand Equivalent and fine aggregate grading tests do not meet the requirements specified for "Contract Compliance," the concrete which is represented by the tests shall be removed. However, if the Engineer determines that the concrete is structurally adequate, the concrete may remain in place, and the Contractor shall pay to the State \$4.60 per cubic meter for paving concrete and \$7.20 per cubic meter for all other concrete for the concrete represented by these tests and left in place. The Department may deduct the amount from any moneys due, or that may become due, the Contractor under the contract.

- The 2 preceding paragraphs apply individually to the "Contract Compliance" requirements for coarse aggregate and fine aggregate. When both coarse aggregate and fine aggregate do not conform to the "Contract Compliance" requirements, both paragraphs shall apply. The payments specified in those paragraphs shall be in addition to any payments made in conformance with the provisions in Section 90-1.01, "Description."

- No single Cleanness Value, Sand Equivalent or aggregate grading test shall represent more than 250 m<sup>3</sup> of concrete

or one day's pour, whichever is smaller.

- 
- When the source of an aggregate is changed, the Contractor shall adjust the mix proportions and submit in writing to the Engineer a copy of the mix design before using the aggregates.

#### **90-2.02A Coarse Aggregate**

- Coarse aggregate shall consist of gravel, crushed gravel, crushed rock, crushed air-cooled iron blast furnace slag or combinations thereof. Crushed air-cooled blast furnace slag shall not be used in reinforced or prestressed concrete.
- Coarse aggregate shall conform to the following quality requirements:

Tests	California Test	Requirements
Loss in Los Angeles Rattler (after 500 revolutions)	211	45% max.
Cleanness Value		
Operating Range	227	75 min.
Contract Compliance	227	71 min.

- In lieu of the above Cleanness Value requirements, a Cleanness Value "Operating Range" limit of 71, minimum, and a Cleanness Value "Contract Compliance" limit of 68, minimum, will be used to determine the acceptability of the coarse aggregate if the Contractor furnishes a Certificate of Compliance, as provided in Section 6-1.07, "Certificates of Compliance," certifying that:

1. coarse aggregate sampled at the completion of processing at the aggregate production plant had a Cleanness Value of not less than 82 when tested by California test 227; and
2. prequalification tests performed in conformance with the requirements in California test 549 indicated that the aggregate would develop a relative strength of not less than 95 percent and would have a relative shrinkage not greater than 105 percent, based on concrete.

#### **90-2.02B Fine Aggregate**

- Fine aggregate shall consist of natural sand, manufactured sand produced from larger aggregate or a combination thereof. Manufactured sand shall be well graded.
- Fine aggregate shall conform to the following quality requirements:

Test	California Test	Requirements
Organic Impurities	213	Satisfactory <sup>a</sup>
Mortar Strengths Relative to Ottawa Sand	515	95%, min.
Sand Equivalent:		
Operating Range	217	75, min.
Contract Compliance	217	71, min.

a Fine aggregate developing a color darker than the reference standard color solution may be accepted if it is determined by the Engineer, from mortar strength tests, that a darker color is acceptable.

- In lieu of the above Sand Equivalent requirements, a Sand Equivalent "Operating Range" limit of 71 minimum and a Sand Equivalent "Contract Compliance" limit of 68 minimum will be used to determine the acceptability of the fine aggregate if the Contractor furnishes a Certificate of Compliance, as provided in Section 6-1.07, "Certificates of Compliance," certifying that:

1. fine aggregate sampled at the completion of processing at the aggregate production plant had a Sand Equivalent value of not less than 82 when tested by California test 217; and
2. prequalification tests performed in conformance with California test 549 indicated that the aggregate would develop a relative strength of not less than 95 percent and would have a relative shrinkage not greater than 105 percent, based on concrete.



### 90-2.03 WATER

- In conventionally reinforced concrete work, the water for curing, for washing aggregates, and for mixing shall be free from oil and shall not contain more than 1000 parts per million of chlorides as Cl, when tested in conformance with California test 422, nor more than 1300 parts per million of sulfates as SO<sub>4</sub>, when tested in conformance with California test 417. In prestressed concrete work, the water for curing, for washing aggregates, and for mixing shall be free from oil and shall not contain more than 650 parts per million of chlorides as Cl, when tested in conformance with California test 422, nor more than 1300 parts per million of sulfates as SO<sub>4</sub>, when tested in conformance with California test 417. In no case shall the water contain an amount of impurities that will cause either: 1) a change in the setting time of cement of more than 25 percent when tested in conformance with the requirements in ASTM Designation: C 191 or ASTM Designation: C 266 or 2) a reduction in the compressive strength of mortar at 14 days of more than 5 percent, when tested in conformance with the requirements in ASTM Designation: C 109, when compared to the results obtained with distilled water or deionized water, tested in conformance with the requirements in ASTM Designation: C 109.

- In non-reinforced concrete work, the water for curing, for washing aggregates and for mixing shall be free from oil and shall not contain more than 2000 parts per million of chlorides as Cl, when tested in conformance with California test 422, or more than 1500 parts per million of sulfates as SO<sub>4</sub>, when tested in conformance with California test 417.

- In addition to the above provisions, water for curing concrete shall not contain impurities in a sufficient amount to cause discoloration of the concrete or produce etching of the surface.

- Water reclaimed from mixer wash-out operations may be used in mixing concrete. The water shall not contain coloring agents or more than 300 parts per million of alkalis (Na<sub>2</sub>O + 0.658 K<sub>2</sub>O) as determined on the filtrate. The specific gravity of the water shall not exceed 1.03 and shall not vary more than ±0.010 during a day's operations.

### 90-2.04 ADMIXTURE MATERIALS

- Admixture materials shall conform to the requirements in the following ASTM Designations:

- A. Chemical Admixtures—ASTM Designation: C 494.

- B. Air-entraining Admixtures—ASTM Designation: C 260.

- C. Calcium Chloride—ASTM Designation: D 98.

- D. Mineral Admixtures—Coal fly ash; raw or calcined natural pozzolan as specified in ASTM Designation: C 618; silica fume conforming to the requirements in ASTM Designation: C 1240, with reduction of mortar expansion of 80 percent, minimum, using the cement from the proposed mix design.

- Unless otherwise specified in the special provisions, mineral admixtures shall be used in conformance with the provisions in Section 90-4.08, "Required Use of Mineral Admixtures."

## 90-3 AGGREGATE GRADINGS

### 90-3.01 GENERAL

- Before beginning concrete work, the Contractor shall submit in writing to the Engineer the gradation of the primary aggregate nominal sizes that the Contractor proposes to furnish. If a primary coarse aggregate or the fine aggregate is separated into 2 or more sizes, the proposed gradation shall consist of the gradation for each individual size, and the proposed proportions of each individual size, combined mathematically to indicate one proposed gradation. The proposed gradation shall meet the grading requirements shown in the table in this section, and shall show the percentage passing each of the sieve sizes used in determining the end result.

- The Engineer may waive, in writing, the gradation requirements in this Section 90-3.01 and in Sections 90-3.02, "Coarse Aggregate Grading," 90-3.03, "Fine Aggregate Grading," and 90-3.04, "Combined Aggregate Gradings," if, in the Engineer's opinion, furnishing the gradation is not necessary for the type or amount of concrete work to be constructed.

- Gradations proposed by the Contractor shall be within the following percentage passing limits:

Primary Aggregate Nominal Size	Sieve Size	Limits of Proposed Gradation
37.5-mm x 19-mm	25-mm	19 - 41
25-mm x 4.75-mm	19-mm	52 - 85
25-mm x 4.75-mm	9.5-mm	15 - 38
12.5-mm x 4.75-mm	9.5-mm	40 - 78
9.5-mm x 2.36-mm	9.5-mm	50 - 85

Fine Aggregate	1.18-mm	55 - 75
Fine Aggregate	600- $\mu$ m	34 - 46
Fine Aggregate	300- $\mu$ m	16 - 29

- Should the Contractor change the source of supply, the Contractor shall submit in writing to the Engineer the new gradations before their intended use.

### 90-3.02 COARSE AGGREGATE GRADING

- The grading requirements for coarse aggregates are shown in the following table for each size of coarse aggregate:

Sieve Sizes	Percentage Passing Primary Aggregate Nominal Sizes							
	37.5-mm x 19-mm		25-mm x 4.75-mm		12.5-mm x 4.75-mm		9.5-mm x 2.36-mm	
	Operating Range	Contract Compliance	Operating Range	Contract Compliance	Operating Range	Contract Compliance	Operating Range	Contract Compliance
50-mm	100	100	—	—	—	—	—	—
37.5-mm	88-100	85-100	100	100	—	—	—	—
25-mm	x $\pm$ 18	X $\pm$ 25	88-100	86-100	—	—	—	—
19-mm	0-17	0-20	X $\pm$ 15	X $\pm$ 22	100	100	—	—
12.5-mm	—	—	—	—	82-100	80-100	100	100
9.5-mm	0-7	0-9	X $\pm$ 15	X $\pm$ 22	X $\pm$ 15	X $\pm$ 22	X $\pm$ 15	X $\pm$ 20
4.75-mm	—	—	0-16	0-18	0-15	0-18	0-25	0-28
2.36-mm	—	—	0-6	0-7	0-6	0-7	0-6	0-7

- In the above table, the symbol X is the gradation that the Contractor proposes to furnish for the specific sieve size as provided in Section 90-3.01, "General."

Coarse aggregate for the 37.5-mm, maximum, combined aggregate grading as provided in Section 90-3.04, "Combined Aggregate Gradings," shall be furnished in 2 or more primary aggregate nominal sizes. Each primary aggregate nominal size may be separated into 2 sizes and stored separately, provided that the combined material conforms to the grading requirements for that particular primary aggregate nominal size.

- When the 25-mm, maximum, combined aggregate grading as provided in Section 90-3.04, "Combined Aggregate Gradings," is to be used, the coarse aggregate may be separated into 2 sizes and stored separately, provided that the combined material shall conform to the grading requirements for the 25-mm x 4.75-mm primary aggregate nominal size.

### 90-3.03 FINE AGGREGATE GRADING

- Fine aggregate shall be graded within the following limits:

Sieve Sizes	Percentage Passing	
	Operating Range	Contract Compliance
9.5-mm	100	100
4.75-mm	95-100	93-100
2.36-mm	65-95	61-99
1.18-mm	X $\pm$ 10	X $\pm$ 13
600- $\mu$ m	X $\pm$ 9	X $\pm$ 12
300- $\mu$ m	X $\pm$ 6	X $\pm$ 9
150- $\mu$ m	2-12	1-15
75- $\mu$ m	0-8	0-10

- In the above table, the symbol X is the gradation that the Contractor proposes to furnish for the specific sieve size as provided in Section 90-3.01, "General."

In addition to the above required grading analysis, the distribution of the fine aggregate sizes shall be such that the difference between the total percentage passing the 1.18-mm sieve and the total percentage passing the 600- $\mu$ m sieve shall be between 10 and 40, and the difference between the percentage passing the 600- $\mu$ m and 300- $\mu$ m sieves shall be between 10 and 40.

- Fine aggregate may be separated into 2 or more sizes and stored separately, provided that the combined material conforms to the grading requirements specified in this Section 90-3.03.

#### 90-3.04 COMBINED AGGREGATE GRADINGS

- Combined aggregate grading limits shall be used only for the design of concrete mixes. Concrete mixes shall be designed so that aggregates are combined in proportions that shall produce a mixture within the grading limits for combined aggregates as specified herein. Within these limitations, the relative proportions shall be as ordered by the Engineer, except as otherwise provided in Section 90-1.01, "Description."

- The combined aggregate grading, except when otherwise specified in these specifications or the special provisions, shall be either the 37.5-mm, maximum grading, or the 25-mm, maximum grading, at the option of the Contractor.

Grading Limits of Combined Aggregates

Sieve Sizes	Percentage Passing			
	37.5-mm Max.	25-mm Max.	12.5-mm Max.	9.5-mm Max.
50-mm	100	—	—	—
37.5-mm	90-100	100	—	—
25-mm	50-86	90-100	—	—
19-mm	45-75	55-100	100	—
12.5-mm	—	—	90-100	100
9.5-mm	38-55	45-75	55-86	50 - 100
4.75-mm	30-45	35-60	45-63	45 - 63
2.36-mm	23-38	27-45	35-49	35 - 49
1.18-mm	17-33	20-35	25-37	25 - 37
600-µm	10-22	12-25	15-25	15 - 25
300-µm	4-10	5-15	5-15	5 - 15
150-µm	1-6	1-8	1-8	1 - 8
75-µm	0-3	0-4	0-4	0 - 4

- Changes from one grading to another shall not be made during the progress of the work unless permitted by the Engineer.

#### 90-4 ADMIXTURES

##### 90-4.01 GENERAL

- Admixtures used in portland cement concrete shall conform to and be used in conformance with the provisions in this Section 90-4 and the special provisions. Admixtures shall be used when specified or ordered by the Engineer and may be used at the Contractor's option as provided herein.

- Chemical admixtures and air-entraining admixtures containing chlorides as Cl in excess of one percent by mass of admixture, as determined by California test 415, shall not be used in prestressed or reinforced concrete.

- Calcium chloride shall not be used in concrete except when otherwise specified.

- Mineral admixture used in concrete for exposed surfaces of like elements of a structure shall be from the same source and of the same percentage.

- Admixtures shall be uniform in properties throughout their use in the work. Should it be found that an admixture as furnished is not uniform in properties, its use shall be discontinued.

- If more than one admixture is used, the admixtures shall be compatible with each other so that the desirable effects of all admixtures used will be realized.

##### 90-4.02 MATERIALS

- Admixture materials shall conform to the provisions in Section 90-2.04, "Admixture Materials."

##### 90-4.03 ADMIXTURE APPROVAL

- No admixture brand shall be used in the work unless it is on the Department's current list of approved brands for the type of admixture involved.

- Admixture brands will be considered for addition to the approved list if the manufacturer of the admixture submits to the Transportation Laboratory a sample of the admixture accompanied by certified test results demonstrating that the admixture complies with the requirements in the appropriate ASTM Designation and these specifications. The sample shall be sufficient to permit performance of all required tests. Approval of admixture brands will be dependent upon a determination as to compliance with the requirements, based on the certified test results submitted, together with tests the Department may elect to perform.

- When the Contractor proposes to use an admixture of a brand and type on the current list of approved admixture brands, the Contractor shall furnish a Certificate of Compliance from the manufacturer, as provided in Section 6-1.07, "Certificates of Compliance," certifying that the admixture furnished is the same as that previously approved. If a previously approved admixture is not accompanied by a Certificate of Compliance, the admixture shall not be used in the work until the Engineer has had sufficient time to make the appropriate tests and has approved the admixture for use. The Engineer may take samples for testing at any time, whether or not the admixture has been accompanied by a Certificate of Compliance.

- If a mineral admixture is delivered directly to the site of the work, the Certificate of Compliance shall be signed by the manufacturer or supplier of the mineral admixture. If the mineral admixture is used in ready-mix concrete or in precast concrete products purchased as such by the Contractor, the Certificate of Compliance shall be signed by the manufacturer of the concrete or product.

#### **90-4.04 REQUIRED USE OF CHEMICAL ADMIXTURES AND CALCIUM CHLORIDE**

- When the use of a chemical admixture or calcium chloride is specified, the admixture shall be used at the dosage specified, except that if no dosage is specified, the admixture shall be used at the dosage normally recommended by the manufacturer of the admixture.

- Calcium chloride shall be dispensed in liquid, flake, or pellet form. Calcium chloride dispensed in liquid form shall conform to the provisions for dispensing liquid admixtures in Section 90-4.10, "Proportioning and Dispensing Liquid Admixtures."

#### **90-4.05 OPTIONAL USE OF CHEMICAL ADMIXTURES**

- The Contractor will be permitted to use Type A or F, water-reducing; Type B, retarding; or Type D or G, water-reducing and retarding admixtures as described in ASTM Designation: C 494 to conserve cementitious material or to facilitate any concrete construction application subject to the following conditions:

- A. When a water-reducing admixture or a water-reducing and retarding admixture is used, the cementitious material content specified or ordered may be reduced by a maximum of 5 percent by mass, except that the resultant cementitious material content shall be not less than 300 kilograms per cubic meter; and
- B. When a reduction in cementitious material content is made, the dosage of admixture used shall be the dosage used in determining approval of the admixture.

- Unless otherwise specified, a Type C accelerating chemical admixture conforming to the requirements in ASTM Designation: C 494, may be used in portland cement concrete. Inclusion in the mix design submitted for approval will not be required provided that the admixture is added to counteract changing conditions that contribute to delayed setting of the portland cement concrete, and the use or change in dosage of the admixture is approved in writing by the Engineer.

#### **90-4.06 REQUIRED USE OF AIR-ENTRAINING ADMIXTURES**

- When air-entrainment is specified or ordered by the Engineer, the air-entraining admixture shall be used in amounts to produce a concrete having the specified air content as determined by California test 504.

#### **90-4.07 OPTIONAL USE OF AIR-ENTRAINING ADMIXTURES**

- When air-entrainment has not been specified or ordered by the Engineer, the Contractor will be permitted to use an air-entraining admixture to facilitate the use of any construction procedure or equipment provided that the average air content, as determined by California Test 504, of 3 successive tests does not exceed 4 percent, and no single test value exceeds 5.5 percent. If the Contractor elects to use an air-entraining admixture in concrete for pavement, the Contractor shall so indicate at the time the Contractor designates the source of aggregate as provided in Section 40-1.015, "Cement Content."

#### **90-4.08 REQUIRED USE OF MINERAL ADMIXTURES**

- Unless otherwise specified, mineral admixture shall be combined with cement to make cementitious material.
- The calcium oxide content of mineral admixtures shall not exceed 10 percent and the available alkali, as sodium oxide equivalent, shall not exceed 1.5 percent when determined in conformance with the requirements in ASTM Designation: C 618.
- The amounts of cement and mineral admixture used in cementitious material shall be sufficient to satisfy the minimum cementitious material content requirements specified in Section 90-1.01, "Description," or Section 90-4.05, "Optional Use of Chemical Admixtures," and shall conform to the following:

- A. The minimum amount of cement shall not be less than 75 percent by mass of the specified minimum cementitious

material content;

- B. The minimum amount of mineral admixture to be combined with cement shall be determined using one of the following criteria:
1. When the calcium oxide content of a mineral admixture is equal to or less than 2 percent by mass, the amount of mineral admixture shall not be less than 15 percent by mass of the total amount of cementitious material to be used in the mix;
  2. When the calcium oxide content of a mineral admixture is greater than 2 percent, the amount of mineral admixture shall not be less than 25 percent by mass of the total amount of cementitious material to be used in the mix;
  3. When a mineral admixture that conforms to the provisions for silica fume in Section 90-2.04, "Admixture Materials," is used, the amount of mineral admixture shall not be less than 10 percent by mass of the total amount of cementitious material to be used in the mix
- C. The total amount of mineral admixture shall not exceed 35 percent by mass of the total amount of cementitious material to be used in the mix. Where Section 90-1.01, "Description," specifies a maximum cementitious content in kilograms per cubic meter, the total mass of cement and mineral admixture per cubic meter shall not exceed the specified maximum cementitious material content.

#### **90-4.09 BLANK**

#### **90-4.10 PROPORTIONING AND DISPENSING LIQUID ADMIXTURES**

- Chemical admixtures and air-entraining admixtures shall be dispensed in liquid form. Dispensers for liquid admixtures shall have sufficient capacity to measure at one time the prescribed quantity required for each batch of concrete. Each dispenser shall include a graduated measuring unit into which liquid admixtures are measured to within  $\pm 5$  percent of the prescribed quantity for each batch. Dispensers shall be located and maintained so that the graduations can be accurately read from the point at which proportioning operations are controlled to permit a visual check of batching accuracy prior to discharge. Each measuring unit shall be clearly marked for the type and quantity of admixture.

- Each liquid admixture dispensing system shall be equipped with a sampling device consisting of a valve located in a safe and readily accessible position such that a sample of the admixture may be withdrawn slowly by the Engineer.

- If more than one liquid admixture is used in the concrete mix, each liquid admixture shall have a separate measuring unit and shall be dispensed by injecting equipment located in such a manner that the admixtures are not mixed at high concentrations and do not interfere with the effectiveness of each other. When air-entraining admixtures are used in conjunction with other liquid admixtures, the air-entraining admixture shall be the first to be incorporated into the mix.

- When automatic proportioning devices are required for concrete pavement, dispensers for liquid admixtures shall operate automatically with the batching control equipment. The dispensers shall be equipped with an automatic warning system in good operating condition that will provide a visible or audible signal at the point at which proportioning operations are controlled when the quantity of admixture measured for each batch of concrete varies from the preselected dosage by more than 5 percent, or when the entire contents of the measuring unit are not emptied from the dispenser into each batch of concrete.

- Unless liquid admixtures are added to premeasured water for the batch, their discharge into the batch shall be arranged to flow into the stream of water so that the admixtures are well dispersed throughout the batch, except that air-entraining admixtures may be dispensed directly into moist sand in the batching bins provided that adequate control of the air content of the concrete can be maintained.

- Liquid admixtures requiring dosages greater than  $2.5 \text{ L/m}^3$  shall be considered to be water when determining the total amount of free water as specified in Section 90-6.06, "Amount of Water and Penetration."

- Special admixtures, such as "high range" water reducers that may contribute to a high rate of slump loss, shall be measured and dispensed as recommended by the admixture manufacturer and as approved by the Engineer.

#### **90-4.11 STORAGE, PROPORTIONING, AND DISPENSING OF MINERAL ADMIXTURES**

- Mineral admixtures shall be protected from exposure to moisture until used. Sacked material shall be piled to permit access for tally, inspection and identification for each shipment.

- Adequate facilities shall be provided to assure that mineral admixtures meeting the specified requirements are kept separate from other mineral admixtures in order to prevent any but the specified mineral admixtures from entering the work. Safe and suitable facilities for sampling mineral admixtures shall be provided at the weigh hopper or in the feed line immediately in advance of the hopper.

- Mineral admixtures shall be incorporated into concrete using equipment conforming to the requirements for cement weigh hoppers, and charging and discharging mechanisms in ASTM Designation: C 94, in Section 90-5.03, "Proportioning,"

and in this Section 90-4.11.

- When concrete is completely mixed in stationary paving mixers, the mineral admixture shall be weighed in a separate weigh hopper conforming to the provisions for cement weigh hoppers and charging and discharging mechanisms in Section 90-5.03A, "Proportioning for Pavement," and the mineral admixture and cement shall be introduced simultaneously into the mixer proportionately with the aggregate. If the mineral admixture is not weighed in a separate weigh hopper, the Contractor shall provide certification that the stationary mixer is capable of mixing the cement, admixture, aggregates and water uniformly prior to discharge. Certification shall contain the following:

- A. Test results for 2 compressive strength test cylinders of concrete taken within the first one-third and 2 compressive strength test cylinders of concrete taken within the last one-third of the concrete discharged from a single batch from the stationary paving mixer. Strength tests and cylinder preparation will be in conformance with the provisions of Section 90-9, "Compressive Strength;"
- B. Calculations demonstrating that the difference in the averages of 2 compressive strengths taken in the first one-third is no greater than 7.5 percent different than the averages of 2 compressive strengths taken in the last one-third of the concrete discharged from a single batch from the stationary paving mixer. Strength tests and cylinder preparation will be in conformance with the provisions of Section 90-9, "Compressive Strength;" and
- C. The mixer rotation speed and time of mixing prior to discharge that are required to produce a mix that meets the requirements above.

## **90-5 PROPORTIONING**

### **90-5.01 STORAGE OF AGGREGATES**

- Aggregates shall be stored or stockpiled in such a manner that separation of coarse and fine particles of each size shall be avoided and also that the various sizes shall not become intermixed before proportioning.

- Aggregates shall be stored or stockpiled and handled in a manner that shall prevent contamination by foreign materials. In addition, storage of aggregates at batching or mixing facilities that are erected subsequent to the award of the contract and that furnish concrete to the project shall conform to the following:

- A. Intermingling of the different sizes of aggregates shall be positively prevented. The Contractor shall take the necessary measures to prevent intermingling. The preventive measures may include, but are not necessarily limited to, physical separation of stockpiles or construction of bulkheads of adequate length and height; and
- B. Contamination of aggregates by contact with the ground shall be positively prevented. The Contractor shall take the necessary measures to prevent contamination. The preventive measures shall include, but are not necessarily limited to, placing aggregates on wooden platforms or on hardened surfaces consisting of portland cement concrete, asphalt concrete, or cement treated material.

- In placing aggregates in storage or in moving the aggregates from storage to the weigh hopper of the batching plant, any method that may cause segregation, degradation, or the combining of materials of different gradings that will result in any size of aggregate at the weigh hopper failing to meet the grading requirements, shall be discontinued. Any method of handling aggregates that results in excessive breakage of particles shall be discontinued. The use of suitable devices to reduce impact of falling aggregates may be required by the Engineer.

### **90-5.02 PROPORTIONING DEVICES**

- Weighing, measuring, or metering devices used for proportioning materials shall conform to the requirements in Section 9-1.01, "Measurement of Quantities," and this Section 90-5.02. In addition, automatic weighing systems shall comply with the requirements for automatic proportioning devices in Section 90-5.03A, "Proportioning for Pavement." Automatic devices shall be automatic to the extent that the only manual operation required for proportioning the aggregates, cement, and mineral admixture for one batch of concrete is a single operation of a switch or starter.

- Proportioning devices shall be tested at the expense of the Contractor as frequently as the Engineer may deem necessary to ensure their accuracy.

- Weighing equipment shall be insulated against vibration or movement of other operating equipment in the plant. When the plant is in operation, the mass of each batch of material shall not vary from the mass designated by the Engineer by more than the tolerances specified herein.

- Equipment for cumulative weighing of aggregate shall have a zero tolerance of  $\pm 0.5$  percent of the designated total batch mass of the aggregate. For systems with individual weigh hoppers for the various sizes of aggregate, the zero tolerance shall be  $\pm 0.5$  percent of the individual batch mass designated for each size of aggregate. Equipment for cumulative weighing of cement and mineral admixtures shall have a zero tolerance of  $\pm 0.5$  percent of the designated total batch mass of the

cement and mineral admixture. Equipment for weighing cement or mineral admixture separately shall have a zero tolerance of  $\pm 0.5$  percent of their designated individual batch masses. Equipment for measuring water shall have a zero tolerance of  $\pm 0.5$  percent of its designated mass or volume.

- The mass indicated for any batch of material shall not vary from the preselected scale setting by more than the following:

- A. Aggregate weighed cumulatively shall be within 1.0 percent of the designated total batch mass of the aggregate. Aggregates weighed individually shall be within 1.5 percent of their respective designated batch masses; and
- B. Cement shall be within 1.0 percent of its designated batch mass. When weighed individually, mineral admixture shall be within 1.0 percent of its designated batch mass. When mineral admixture and cement are permitted to be weighed cumulatively, cement shall be weighed first to within 1.0 percent of its designated batch mass, and the total for cement and mineral admixture shall be within 1.0 percent of the sum of their designated batch masses; and
- C. Water shall be within 1.5 percent of its designated mass or volume.

- Each scale graduation shall be approximately 0.001 of the total capacity of the scale. The capacity of scales for weighing cement, mineral admixture, or cement plus mineral admixture and aggregates shall not exceed that of commercially available scales having single graduations indicating a mass not exceeding the maximum permissible mass variation above, except that no scale shall be required having a capacity of less than 500 kg, with 0.5-kg graduations.

### **90-5.03 PROPORTIONING**

- Proportioning shall consist of dividing the aggregates into the specified sizes, each stored in a separate bin, and combining them with cement, mineral admixture, and water as provided in these specifications. Aggregates shall be proportioned by mass.

- At the time of batching, aggregates shall have been dried or drained sufficiently to result in a stable moisture content such that no visible separation of water from aggregate will take place during transportation from the proportioning plant to the point of mixing. In no event shall the free moisture content of the fine aggregate at the time of batching exceed 8 percent of its saturated, surface-dry mass.

- Should separate supplies of aggregate material of the same size group, but of different moisture content or specific gravity or surface characteristics affecting workability, be available at the proportioning plant, withdrawals shall be made from one supply exclusively and the materials therein completely exhausted before starting upon another.

- Bulk "Type IP (MS) Modified" cement shall be weighed in an individual hopper and shall be kept separate from the aggregates until the ingredients are released for discharge into the mixer.

- Bulk cement and mineral admixture may be weighed in separate, individual weigh hoppers or may be weighed in the same weigh hopper and shall be kept separate from the aggregates until the ingredients are released for discharge into the mixer. If the cement and mineral admixture are weighed cumulatively, the cement shall be weighed first.

- When cement and mineral admixtures are weighed in separate weigh hoppers, the weigh systems for the proportioning of the aggregate, the cement, and the mineral admixture shall be individual and distinct from all other weigh systems. Each weigh system shall be equipped with a hopper, a lever system, and an indicator to constitute an individual and independent material weighing device. The cement and the mineral admixture shall be discharged into the mixer simultaneously with the aggregate.

- The scales and weigh hoppers for bulk weighing cement, mineral admixture, or cement plus mineral admixture shall be separate and distinct from the aggregate weighing equipment.

- For batches with a volume of one cubic meter or more, the batching equipment shall conform to one of the following combinations:

- A. Separate boxes and separate scale and indicator for weighing each size of aggregate.
- B. Single box and scale indicator for all aggregates.
- C. Single box or separate boxes and automatic weighing mechanism for all aggregates.

- In order to check the accuracy of batch masses, the gross mass and tare mass of batch trucks, truck mixers, truck agitators, and non-agitating hauling equipment shall be determined when ordered by the Engineer. The equipment shall be weighed at the Contractor's expense on scales designated by the Engineer.

#### **90-5.03A Proportioning for Pavement**

- Aggregates and bulk cement, mineral admixture, and cement plus mineral admixture for use in pavement shall be proportioned by mass by means of automatic proportioning devices of approved type conforming to these specifications.

- The Contractor shall install and maintain in operating condition an electronically actuated moisture meter that will

indicate, on a readily visible scale, changes in the moisture content of the fine aggregate as it is batched within a sensitivity of 0.5 percent by mass of the fine aggregate.

- The batching of cement, mineral admixture, or cement plus mineral admixture and aggregate shall be interlocked so that a new batch cannot be started until all weigh hoppers are empty, the proportioning devices are within zero tolerance, and the discharge gates are closed. The interlock shall permit no part of the batch to be discharged until all aggregate hoppers and the cement and mineral admixture hoppers or the cement plus mineral admixture hopper are charged with masses that are within the tolerances specified in Section 90-5.02, "Proportioning Devices."

- When interlocks are required for cement and mineral admixture charging mechanisms and cement and mineral admixtures are weighed cumulatively, their charging mechanisms shall be interlocked to prevent the introduction of mineral admixture until the mass of cement in the cement weigh hopper is within the tolerances specified in Section 90-5.02, "Proportioning Devices."

- The discharge gate on the cement and mineral admixture hoppers or the cement plus mineral admixture hopper shall be designed to permit regulating the flow of cement, mineral admixture, or cement plus mineral admixture into the aggregate as directed by the Engineer.

- When separate weigh boxes are used for each size of aggregate, the discharge gates shall permit regulating the flow of each size of aggregate as directed by the Engineer.

- Material discharged from the several bins shall be controlled by gates or by mechanical conveyors. The means of withdrawal from the several bins, and of discharge from the weigh box, shall be interlocked so that not more than one bin can discharge at a time, and so that the weigh box cannot be tripped until the required quantity from each of the several bins has been deposited therein. Should a separate weigh box be used for each size of aggregate, all may be operated and discharged simultaneously.

- When the discharge from the several bins is controlled by gates, each gate shall be actuated automatically so that the required mass is discharged into the weigh box, after which the gate shall automatically close and lock.

- The automatic weighing system shall be designed so that all proportions required may be set on the weighing controller at the same time.

## **90-6 MIXING AND TRANSPORTING**

### **90-6.01 GENERAL**

- Concrete shall be mixed in mechanically operated mixers, except that when permitted by the Engineer, batches not exceeding 0.25 m<sup>3</sup> may be mixed by hand methods in conformance with the provisions in Section 90-6.05, "Hand-Mixing."

- Equipment having components made of aluminum or magnesium alloys that would have contact with plastic concrete during mixing, transporting, or pumping of portland cement concrete shall not be used.

- Concrete shall be homogeneous and thoroughly mixed, and there shall be no lumps or evidence of undispersed cement, mineral admixture, or cement plus mineral admixture.

- Uniformity of concrete mixtures will be determined by differences in penetration as determined by California Test 533, or slump as determined by ASTM Designation: C 143, and by variations in the proportion of coarse aggregate as determined by California Test 529.

- When the mix design specifies a penetration value, the difference in penetration, determined by comparing penetration tests on 2 samples of mixed concrete from the same batch or truck mixer load, shall not exceed 10 mm. When the mix design specifies a slump value, the difference in slump, determined by comparing slump tests on 2 samples of mixed concrete from the same batch or truck mixer load, shall not exceed the values given in the table below. Variation in the proportion of coarse aggregate will be determined by comparing the results of tests of 2 samples of mixed concrete from the same batch or truck mixer load and the difference between the 2 results shall not exceed 100 kg per cubic meter of concrete.

Average Slump	Maximum Permissible Difference
Less than 100-mm	25-mm
100-mm to 150-mm	38-mm
Greater than 150-mm to 225-mm	50-mm

- The Contractor, at the Contractor's expense, shall furnish samples of the freshly mixed concrete and provide satisfactory facilities for obtaining the samples.

### **90-6.02 MACHINE MIXING**

- Concrete mixers may be of the revolving drum or the revolving blade type, and the mixing drum or blades shall be operated uniformly at the mixing speed recommended by the manufacturer. Mixers and agitators that have an accumulation



of hard concrete or mortar shall not be used.

- The temperature of mixed concrete, immediately before placing, shall be not less than 10°C or more than 32°C. Aggregates and water shall be heated or cooled as necessary to produce concrete within these temperature limits. Neither aggregates nor mixing water shall be heated to exceed 65°C. If ice is used to cool the concrete, discharge of the mixer will not be permitted until all ice is melted.

- The batch shall be so charged into the mixer that some water will enter in advance of cementitious materials and aggregates. All water shall be in the drum by the end of the first one-fourth of the specified mixing time.

- Cementitious materials shall be batched and charged into the mixer by means that will not result either in loss of cementitious materials due to the effect of wind, in accumulation of cementitious materials on surfaces of conveyors or hoppers, or in other conditions that reduce or vary the required quantity of cementitious material in the concrete mixture.

- Paving and stationary mixers shall be operated with an automatic timing device. The timing device and discharge mechanism shall be interlocked so that during normal operation no part of the batch will be discharged until the specified mixing time has elapsed.

- The total elapsed time between the intermingling of damp aggregates and all cementitious materials and the start of mixing shall not exceed 30 minutes.

- The size of batch shall not exceed the manufacturer's guaranteed capacity.

- When producing concrete for pavement or base, suitable batch counters shall be installed and maintained in good operating condition at jobsite batching plants and stationary mixers. The batch counters shall indicate the exact number of batches proportioned and mixed.

- Concrete shall be mixed and delivered to the jobsite by means of one of the following combinations of operations:

- A. Mixed completely in a stationary mixer and the mixed concrete transported to the point of delivery in truck agitators or in non-agitating hauling equipment (central-mixed concrete).

- B. Mixed partially in a stationary mixer, and the mixing completed in a truck mixer (shrink-mixed concrete).

- C. Mixed completely in a truck mixer (transit-mixed concrete).

- D. Mixed completely in a paving mixer.

- Agitators may be truck mixers operating at agitating speed or truck agitators. Each mixer and agitator shall have attached thereto in a prominent place a metal plate or plates on which is plainly marked the various uses for which the equipment is designed, the manufacturer's guaranteed capacity of the drum or container in terms of the volume of mixed concrete and the speed of rotation of the mixing drum or blades.

- Truck mixers shall be equipped with electrically or mechanically actuated revolution counters by which the number of revolutions of the drum or blades may readily be verified.

- When shrink-mixed concrete is furnished, concrete that has been partially mixed at a central plant shall be transferred to a truck mixer and all requirements for transit-mixed concrete shall apply. No credit in the number of revolutions at mixing speed shall be allowed for partial mixing in a central plant.

#### **90-6.03 TRANSPORTING MIXED CONCRETE**

- Mixed concrete may be transported to the delivery point in truck agitators or truck mixers operating at the speed designated by the manufacturer of the equipment as agitating speed, or in non-agitating hauling equipment, provided the consistency and workability of the mixed concrete upon discharge at the delivery point is suitable for adequate placement and consolidation in place, and provided the mixed concrete after hauling to the delivery point conforms to the provisions in Section 90-6.01, "General."

- Truck agitators shall be loaded not to exceed the manufacturer's guaranteed capacity and shall maintain the mixed concrete in a thoroughly mixed and uniform mass during hauling.

- Bodies of non-agitating hauling equipment shall be constructed so that leakage of the concrete mix, or any part thereof, will not occur at any time.

- Concrete hauled in open-top vehicles shall be protected during hauling against rain or against exposure to the sun for more than 20 minutes when the ambient temperature exceeds 24°C.

- No additional mixing water shall be incorporated into the concrete during hauling or after arrival at the delivery point, unless authorized by the Engineer. If the Engineer authorizes additional water to be incorporated into the concrete, the drum shall be revolved not less than 30 revolutions at mixing speed after the water is added and before discharge is commenced.

- The rate of discharge of mixed concrete from truck mixer-agitators shall be controlled by the speed of rotation of the drum in the discharge direction with the discharge gate fully open.

- When a truck mixer or agitator is used for transporting concrete to the delivery point, discharge shall be completed within 1.5 hours or before 250 revolutions of the drum or blades, whichever occurs first, after the introduction of the cement

to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 30°C or above, the time allowed may be less than 1.5 hours.

- When non-agitating hauling equipment is used for transporting concrete to the delivery point, discharge shall be completed within one hour after the addition of the cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 30°C or above, the time between the introduction of cement to the aggregates and discharge shall not exceed 45 minutes.

- Each load of concrete delivered at the jobsite shall be accompanied by a weighmaster certificate showing the mix identification number, non-repeating load number, date and time at which the materials were batched, the total amount of water added to the load, and for transit-mixed concrete, the reading of the revolution counter at the time the truck mixer is charged with cement. This weighmaster certificate shall also show the actual scale masses (kilograms) for the ingredients batched. Theoretical or target batch masses shall not be used as a substitute for actual scale masses.

- Weighmaster certificates shall be provided in printed form, or if approved by the Engineer, the data may be submitted in electronic media. Electronic media shall be presented in a tab-delimited format on a 90 mm diskette with a capacity of at least 1.4 megabytes. Captured data, for the ingredients represented by each batch shall be "line feed, carriage return" (LFCR) and "one line, separate record" with allowances for sufficient fields to satisfy the amount of data required by these specifications.

- The Contractor may furnish a weighmaster certificate accompanied by a separate certificate that lists the actual batch masses or measurements for a load of concrete provided that both certificates are imprinted with the same non-repeating load number that is unique to the contract and delivered to the jobsite with the load.

- Weighmaster certificates furnished by the Contractor shall conform to the provisions in Section 9-1.01, "Measurement of Quantities."

#### **90-6.04 TIME OR AMOUNT OF MIXING**

- Mixing of concrete in paving or stationary mixers shall continue for the required mixing time after all ingredients, except water and admixture, if added with the water, are in the mixing compartment of the mixer before any part of the batch is released. Transfer time in multiple drum mixers shall not be counted as part of the required mixing time.

- The required mixing time, in paving or stationary mixers, of concrete used for concrete structures, except minor structures, shall be not less than 90 seconds or more than 5 minutes, except that when directed by the Engineer in writing, the requirements of the following paragraph shall apply.

- The required mixing time, in paving or stationary mixers, except as provided in the preceding paragraph, shall be not less than 50 seconds or more than 5 minutes.

- The minimum required revolutions at the mixing speed for transit-mixed concrete shall not be less than that recommended by the mixer manufacturer, but in no case shall the number of revolutions be less than that required to consistently produce concrete conforming to the provisions for uniformity in Section 90-6.01, "General."

#### **90-6.05 HAND-MIXING**

- Hand-mixed concrete shall be made in batches of not more than 0.25 m<sup>3</sup> and shall be mixed on a watertight, level platform. The proper amount of coarse aggregate shall be measured in measuring boxes and spread on the platform and the fine aggregate shall be spread on this layer, the 2 layers being not more than 0.3 meters in total depth. On this mixture shall be spread the dry cement and mineral admixture and the whole mass turned no fewer than 2 times dry; then sufficient clean water shall be added, evenly distributed, and the whole mass again turned no fewer than 3 times, not including placing in the carriers or forms.

#### **90-6.06 AMOUNT OF WATER AND PENETRATION**

- The amount of water used in concrete mixes shall be regulated so that the penetration of the concrete as determined by California Test 533 or the slump of the concrete as determined by ASTM Designation: C 143 is within the "Nominal" values shown in the following table. When the penetration or slump of the concrete is found to exceed the nominal values listed, the mixture of subsequent batches shall be adjusted to reduce the penetration or slump to a value within the nominal range shown. Batches of concrete with a penetration or slump exceeding the maximum values listed shall not be used in the work. When Type F or Type G chemical admixtures are added to the mix, the penetration requirements shall not apply and the slump shall not exceed 225 mm after the chemical admixtures are added.

Type of Work	Nominal		Maximum	
	Penetration (mm)	Slump (mm)	Penetration (mm)	Slump (mm)
Concrete Pavement	0-25	—	40	—

Non-reinforced concrete facilities	0-35	—	50	—
Reinforced concrete structures				
Sections over 300-mm thick	0-35	—	65	—
Sections 300-mm thick or less	0-50	—	75	—
Concrete placed under water	—	150-200	—	225
Cast-in-place concrete piles	65-90	130-180	100	200

- The amount of free water used in concrete shall not exceed  $183 \text{ kg/m}^3$ , plus 20 kg for each required 100 kg of cementitious material in excess of  $325 \text{ kg/m}^3$ .
- The term free water is defined as the total water in the mixture minus the water absorbed by the aggregates in reaching a saturated surface-dry condition.
- Where there are adverse or difficult conditions that affect the placing of concrete, the above specified penetration and free water content limitations may be exceeded providing the Contractor is granted permission by the Engineer in writing to increase the cementitious material content per cubic meter of concrete. The increase in water and cementitious material shall be at a ratio not to exceed 30 kg of water per added 100 kg of cementitious material per cubic meter. The cost of additional cementitious material and water added under these conditions shall be at the Contractor's expense and no additional compensation will be allowed therefor.
- The equipment for supplying water to the mixer shall be constructed and arranged so that the amount of water added can be measured accurately. Any method of discharging water into the mixer for a batch shall be accurate within 1.5 percent of the quantity of water required to be added to the mix for any position of the mixer. Tanks used to measure water shall be designed so that water cannot enter while water is being discharged into the mixer and discharge into the mixer shall be made rapidly in one operation without dribbling. All equipment shall be arranged so as to permit checking the amount of water delivered by discharging into measured containers.

## 90-7 CURING CONCRETE

### 90-7.01 METHODS OF CURING

- Newly placed concrete shall be cured by the methods specified in this Section 90-7.01 and the special provisions.

#### 90-7.01A Water Method

- The concrete shall be kept continuously wet by the application of water for a minimum curing period of 7 days after the concrete has been placed.
- When a curing medium consisting of cotton mats, rugs, carpets, or earth or sand blankets is to be used to retain the moisture, the entire surface of the concrete shall be kept damp by applying water with a nozzle that so atomizes the flow that a mist and not a spray is formed, until the surface of the concrete is covered with the curing medium. The moisture from the nozzle shall not be applied under pressure directly upon the concrete and shall not be allowed to accumulate on the concrete in a quantity sufficient to cause a flow or wash the surface. At the expiration of the curing period, the concrete surfaces shall be cleared of all curing mediums.
- When concrete bridge decks and flat slabs are to be cured without the use of a curing medium, the entire surface of the bridge deck or slab shall be kept damp by the application of water with an atomizing nozzle as specified in the preceding paragraph, until the concrete has set, after which the entire surface of the concrete shall be sprinkled continuously with water for a period of not less than 7 days.

#### 90-7.01B Curing Compound Method

- Surfaces of the concrete that are exposed to the air shall be sprayed uniformly with a curing compound.
- Curing compounds to be used shall be as follows:
  1. Pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 2, Class B, except the resin type shall be poly-alpha-methylstyrene.
  2. Pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 2, Class B.
  3. Pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 2, Class A.
  4. Non-pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 1, Class B.
  5. Non-pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 1, Class A.
  6. Non-pigmented curing compound with fugitive dye conforming to the requirements in ASTM Designation: C 309, Type 1-D, Class A.

- The infrared scan for the dried vehicle from curing compound (1) shall match the infrared scan on file at the Transportation Laboratory.
- The loss of water for each type of curing compound, when tested in conformance with the requirements in California Test 534, shall not be more than 0.15-kg/m<sup>2</sup> in 24 hours.
- The curing compound to be used will be specified elsewhere in these specifications or in the special provisions.
- When the use of curing compound is required or permitted elsewhere in these specifications or in the special provisions and no specific kind is specified, any of the curing compounds listed above may be used.
- Curing compound shall be applied at a nominal rate of 3.7 m<sup>2</sup>/L, unless otherwise specified.
- At any point, the application rate shall be within  $\pm 1.2$  m<sup>2</sup>/L of the nominal rate specified, and the average application rate shall be within  $\pm 0.5$  m<sup>2</sup>/L of the nominal rate specified when tested in conformance with the requirements in California Test 535. Runs, sags, thin areas, skips, or holidays in the applied curing compound shall be evidence that the application is not satisfactory.
- Curing compounds shall be applied using power operated spray equipment. The power operated spraying equipment shall be equipped with an operational pressure gage and a means of controlling the pressure. Hand spraying of small and irregular areas that are not reasonably accessible to mechanical spraying equipment, in the opinion of the Engineer, may be permitted.
- The curing compound shall be applied to the concrete following the surface finishing operation, immediately before the moisture sheen disappears from the surface, but before any drying shrinkage or craze cracks begin to appear. In the event of any drying or cracking of the surface, application of water with an atomizing nozzle as specified in Section 90-7.01A, "Water Method," shall be started immediately and shall be continued until application of the compound is resumed or started; however, the compound shall not be applied over any resulting freestanding water. Should the film of compound be damaged from any cause before the expiration of 7 days after the concrete is placed in the case of structures and 72 hours in the case of pavement, the damaged portion shall be repaired immediately with additional compound.
- At the time of use, compounds containing pigments shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. A paddle shall be used to loosen all settled pigment from the bottom of the container, and a power driven agitator shall be used to disperse the pigment uniformly throughout the vehicle.
- Agitation shall not introduce air or other foreign substance into the curing compound.
- The manufacturer shall include in the curing compound the necessary additives for control of sagging, pigment settling, leveling, de-emulsification, or other requisite qualities of a satisfactory working material. Pigmented curing compounds shall be manufactured so that the pigment does not settle badly, does not cake or thicken in the container, and does not become granular or curdled. Settlement of pigment shall be a thoroughly wetted, soft, mushy mass permitting the complete and easy vertical penetration of a paddle. Settled pigment shall be easily redispersed, with minimum resistance to the sideways manual motion of the paddle across the bottom of the container, to form a smooth uniform product of the proper consistency.
- Curing compounds shall remain sprayable at temperatures above 4°C and shall not be diluted or altered after manufacture.
- The curing compound shall be packaged in clean 1040-L totes, 210-L barrels or 19-L pails shall be supplied from a suitable storage tank located at the jobsite. The containers shall comply with "Title 49, Code of Federal Regulations, Hazardous Materials Regulations." The 1040-L totes and the 210-L barrels shall have removable lids and airtight fasteners. The 19-L pails shall be round and have standard full open head and bail. Lids with bungholes shall not be permitted. Settling or separation of solids in containers, except tanks, must be completely redispersed with low speed mixing prior to use, in conformance with these specifications and the manufacturer's recommendations. Mixing shall be accomplished either manually by use of a paddle or by use of a mixing blade driven by a drill motor, at low speed. Mixing blades shall be the type used for mixing paint. On site storage tanks shall be kept clean and free of contaminants. Each tank shall have a permanent system designed to completely redisperse settled material without introducing air or other foreign substances.
- Steel containers and lids shall be lined with a coating that will prevent destructive action by the compound or chemical agents in the air space above the compound. The coating shall not come off the container or lid as skins. Containers shall be filled in a manner that will prevent skinning. Plastic containers shall not react with the compound.
- Each container shall be labeled with the manufacturer's name, kind of curing compound, batch number, volume, date of manufacture, and volatile organic compound (VOC) content. The label shall also warn that the curing compound containing pigment shall be well stirred before use. Precautions concerning the handling and the application of curing compound shall be shown on the label of the curing compound containers in conformance with the Construction Safety Orders and General Industry Safety Orders of the State of California.
- Containers of curing compound shall be labeled to indicate that the contents fully comply with the rules and regulations concerning air pollution control in the State of California.
- When the curing compound is shipped in tanks or tank trucks, a shipping invoice shall accompany each load. The invoice shall contain the same information as that required herein for container labels.

- Curing compound will be sampled by the Engineer at the source of supply or at the jobsite or at both locations.
- Curing compound shall be formulated so as to maintain the specified properties for a minimum of one year. The Engineer may require additional testing before use to determine compliance with these specifications if the compound has not been used within one year or whenever the Engineer has reason to believe the compound is no longer satisfactory.
- Tests will be conducted in conformance with the latest ASTM test methods and methods in use by the Transportation Laboratory.

#### **90-7.01C Waterproof Membrane Method**

- The exposed finished surfaces of concrete shall be sprayed with water, using a nozzle that so atomizes the flow that a mist and not a spray is formed, until the concrete has set, after which the curing membrane shall be placed. The curing membrane shall remain in place for a period of not less than 72 hours.
- Sheeting material for curing concrete shall conform to the requirements in AASHTO Designation: M 171 for white reflective materials.
- The sheeting material shall be fabricated into sheets of such width as to provide a complete cover for the entire concrete surface. Joints in the sheets shall be securely cemented together in such a manner as to provide a waterproof joint. The joint seams shall have a minimum lap of 100 mm.
- The sheets shall be securely weighted down by placing a bank of earth on the edges of the sheets or by other means satisfactory to the Engineer.
- Should any portion of the sheets be broken or damaged before the expiration of 72 hours after being placed, the broken or damaged portions shall be immediately repaired with new sheets properly cemented into place.
- Sections of membrane that have lost their waterproof qualities or have been damaged to such an extent as to render them unfit for curing the concrete shall not be used.

#### **90-7.01D Forms-In-Place Method**

- Formed surfaces of concrete may be cured by retaining the forms in place. The forms shall remain in place for a minimum period of 7 days after the concrete has been placed, except that for members over 0.5-m in least dimension the forms shall remain in place for a minimum period of 5 days.
- Joints in the forms and the joints between the end of forms and concrete shall be kept moisture tight during the curing period. Cracks in the forms and cracks between the forms and the concrete shall be resealed by methods subject to the approval of the Engineer.

### **90-7.02 CURING PAVEMENT**

- The entire exposed area of the pavement, including edges, shall be cured by the waterproof membrane method, or curing compound method using curing compound (1) or (2) as the Contractor may elect. Should the side forms be removed before the expiration of 72 hours following the start of curing, the exposed pavement edges shall also be cured. If the pavement is cured by means of the curing compound method, the sawcut and all portions of the curing compound that have been disturbed by sawing operations shall be restored by spraying with additional curing compound.
- Curing shall commence as soon as the finishing process provided in Section 40-1.10, "Final Finishing," has been completed. The method selected shall conform to the provisions in Section 90-7.01, "Methods of Curing."
- When the curing compound method is used, the compound shall be applied to the entire pavement surface by mechanical sprayers. Spraying equipment shall be of the fully atomizing type equipped with a tank agitator that provides for continual agitation of the curing compound during the time of application. The spray shall be adequately protected against wind, and the nozzles shall be so oriented or moved mechanically transversely as to result in the minimum specified rate of coverage being applied uniformly on exposed faces. Hand spraying of small and irregular areas, and areas inaccessible to mechanical spraying equipment, in the opinion of the Engineer, will be permitted. When the ambient air temperature is above 15°C, the Contractor shall fog the surface of the concrete with a fine spray of water as specified in Section 90-7.01A, "Water Method." The surface of the pavement shall be kept moist between the hours of 10:00 a.m. and 4:30 p.m. on the day the concrete is placed. However, the fogging done after the curing compound has been applied shall not begin until the compound has set sufficiently to prevent displacement. Fogging shall be discontinued if ordered in writing by the Engineer.

### **90-7.03 CURING STRUCTURES**

- Newly placed concrete for cast-in-place structures, other than highway bridge decks, shall be cured by the water method, the forms-in-place method, or, as permitted herein, by the curing compound method, in conformance with the provisions in Section 90-7.01, "Methods of Curing."
- The curing compound method using a pigmented curing compound may be used on concrete surfaces of construction joints, surfaces that are to be buried underground, and surfaces where only Ordinary Surface Finish is to be

applied and on which a uniform color is not required and that will not be visible from a public traveled way. If the Contractor elects to use the curing compound method on the bottom slab of box girder spans, the curing compound shall be curing compound (1).

- The top surface of highway bridge decks shall be cured by both the curing compound method and the water method. The curing compound shall be curing compound (1).

- Concrete surfaces of minor structures, as defined in Section 51-1.02, "Minor Structures," shall be cured by the water method, the forms-in-place method or the curing compound method.

- When deemed necessary by the Engineer during periods of hot weather, water shall be applied to concrete surfaces being cured by the curing compound method or by the forms-in-place method, until the Engineer determines that a cooling effect is no longer required. Application of water for this purpose will be paid for as extra work as provided in Section 4-1.03D, "Extra Work."

#### **90-7.04 CURING PRECAST CONCRETE MEMBERS**

- Precast concrete members shall be cured in conformance with any of the methods specified in Section 90-7.01, "Methods of Curing." Curing shall be provided for the minimum time specified for each method or until the concrete reaches its design strength, whichever is less. Steam curing may also be used for precast members and shall conform to the following provisions:

- A. After placement of the concrete, members shall be held for a minimum 4-hour presteaming period. If the ambient air temperature is below 10°C, steam shall be applied during the presteaming period to hold the air surrounding the member at a temperature between 10°C and 32°C.
- B. To prevent moisture loss on exposed surfaces during the presteaming period, members shall be covered as soon as possible after casting or the exposed surfaces shall be kept wet by fog spray or wet blankets.
- C. Enclosures for steam curing shall allow free circulation of steam about the member and shall be constructed to contain the live steam with a minimum moisture loss. The use of tarpaulins or similar flexible covers will be permitted, provided they are kept in good repair and secured in such a manner as to prevent the loss of steam and moisture.
- D. Steam at the jets shall be at low pressure and in a saturated condition. Steam jets shall not impinge directly on the concrete, test cylinders, or forms. During application of the steam, the temperature rise within the enclosure shall not exceed 22°C per hour. The curing temperature throughout the enclosure shall not exceed 65°C and shall be maintained at a constant level for a sufficient time necessary to develop the required transfer strength. Control cylinders shall be covered to prevent moisture loss and shall be placed in a location where temperature is representative of the average temperature of the enclosure.
- E. Temperature recording devices that will provide an accurate, continuous, permanent record of the curing temperature shall be provided. A minimum of one temperature recording device per 60 m of continuous bed length will be required for checking temperature.
- F. Members in pretension beds shall be detensioned immediately after the termination of steam curing while the concrete and forms are still warm, or the temperature under the enclosure shall be maintained above 15°C until the stress is transferred to the concrete.
- G. Curing of precast concrete will be considered completed after termination of the steam curing cycle.

#### **90-7.05 CURING PRECAST PRESTRESSED CONCRETE PILES**

- Newly placed concrete for precast prestressed concrete piles shall be cured in conformance with the provisions in Section 90-7.04, "Curing Precast Concrete Members," except that piles with a class designation ending in C (corrosion resistant) shall be cured as follows:

- A. Piles shall be either steam cured or water cured. If water curing is used, the piles shall be kept continuously wet by the application of water in conformance with the provisions in Section 90-7.01A, "Water Method."
- B. If steam curing is used, the steam curing provisions in Section 90-7.04, "Curing Precast Concrete Members," shall apply except that the piles shall be kept continuously wet for their entire length for a period of not less than 3 days, including the holding and steam curing periods.

#### **90-7.06 CURING SLOPE PROTECTION**

- Concrete slope protection shall be cured in conformance with any of the methods specified in Section 90-7.01, "Methods of Curing."

- Concreted-rock slope protection shall be cured in conformance with any of the methods specified in Section 90-7.01, "Methods of Curing," or with a blanket of earth kept wet for 72 hours, or by sprinkling with a fine spray of water

every 2 hours during the daytime for a period of 3 days.

#### **90-7.07 CURING MISCELLANEOUS CONCRETE WORK**

- Exposed surfaces of curbs shall be cured by pigmented curing compounds as specified in Section 90-7.01B, "Curing Compound Method."
- Concrete sidewalks, gutter depressions, island paving, curb ramps, driveways, and other miscellaneous concrete areas shall be cured in conformance with any of the methods specified in Section 90-7.01, "Methods of Curing."
- Shotcrete shall be cured for at least 72 hours by spraying with water, or by a moist earth blanket, or by any of the methods provided in Section 90-7.01, "Methods of Curing."
- Mortar and grout shall be cured by keeping the surface damp for 3 days.
- After placing, the exposed surfaces of sign structure foundations, including pedestal portions, if constructed, shall be cured for at least 72 hours by spraying with water, or by a moist earth blanket, or by any of the methods provided in Section 90-7.01, "Methods of Curing."

### **90-8 PROTECTING CONCRETE**

#### **90-8.01 GENERAL**

- In addition to the provisions in Section 7-1.16, "Contractor's Responsibility for the Work and Materials," the Contractor shall protect concrete as provided in this Section 90-8.
- Concrete shall not be placed on frozen or ice-coated ground or subgrade nor on ice-coated forms, reinforcing steel, structural steel, conduits, precast members, or construction joints.
- Under rainy conditions, placing of concrete shall be stopped before the quantity of surface water is sufficient to damage surface mortar or cause a flow or wash of the concrete surface, unless the Contractor provides adequate protection against damage.
- Concrete that has been frozen or damaged by other causes, as determined by the Engineer, shall be removed and replaced by the Contractor at the Contractor's expense.

#### **90-8.02 PROTECTING CONCRETE STRUCTURES**

- Structure concrete and shotcrete used as structure concrete shall be maintained at a temperature of not less than 7°C for 72 hours after placing and at not less than 4°C for an additional 4 days. When required by the Engineer, the Contractor shall submit a written outline of the proposed methods for protecting the concrete.

#### **90-8.03 PROTECTING CONCRETE PAVEMENT**

- Pavement concrete shall be maintained at a temperature of not less than 4°C for 72 hours. When required by the Engineer, the Contractor shall submit a written outline of the proposed methods for protecting the concrete.
- Except as provided in Section 7-1.08, "Public Convenience," the Contractor shall protect concrete pavement against construction and other activities that abrade, scar, discolor, reduce texture depth, lower coefficient of friction, or otherwise damage the surface. Stockpiling, drifting, or excessive spillage of soil, gravel, petroleum products, and concrete or asphalt mixes on the surface of concrete pavement is prohibited unless otherwise specified in these specifications, the special provisions or permitted by the Engineer.
- When ordered by the Engineer or shown on the plans or specified in the special provisions, pavement crossings shall be constructed for the convenience of public traffic. The material and work necessary for the construction of the crossings, and their subsequent removal and disposal, will be paid for at the contract unit prices for the items of work involved and if there are no contract items for the work involved, payment for pavement crossings will be made by extra work as provided in Section 4-1.03D, "Extra Work.". Where public traffic will be required to cross over the new pavement, Type III portland cement may be used in concrete, if permitted in writing by the Engineer. The pavement may be opened to traffic as soon as the concrete has developed a modulus of rupture of 3.8 MPa. The modulus of rupture will be determined by California Test 523.
- No traffic or Contractor's equipment, except as hereinafter provided, will be permitted on the pavement before a period of 10 days has elapsed after the concrete has been placed, nor before the concrete has developed a modulus of rupture of at least 3.8 MPa. Concrete that fails to attain a modulus of rupture of 3.8 MPa within 10 days shall not be opened to traffic until directed by the Engineer.
- Equipment for sawing weakened plane joints will be permitted on the pavement as specified in Section 40-1.08B, "Weakened Plane Joints."
- When requested in writing by the Contractor, the tracks on one side of paving equipment will be permitted on the pavement after a modulus of rupture of 2.4 MPa has been attained, provided that:

- A. Unit pressure exerted on the pavement by the paver shall not exceed 135 kPa;
- B. Tracks with cleats, grousers, or similar protuberances shall be modified or shall travel on planks or equivalent protective material, so that the pavement is not damaged; and
- C. No part of the track shall be closer than 0.3-m from the edge of pavement.

- In case of visible cracking of, or other damage to the pavement, operation of the paving equipment on the pavement shall be immediately discontinued.
- Damage to the pavement resulting from early use of pavement by the Contractor's equipment as provided above shall be repaired by the Contractor at the Contractor's expense.
- The State will furnish the molds and machines for testing the concrete for modulus of rupture, and the Contractor, at the Contractor's expense, shall furnish the material and whatever labor the Engineer may require.

## **90-9 COMPRESSIVE STRENGTH**

### **90-9.01 GENERAL**

- Concrete compressive strength requirements consist of a minimum strength that shall be attained before various loads or stresses are applied to the concrete and, for concrete designated by strength, a minimum strength at the age of 28 days or at the age otherwise allowed in Section 90-1.01, "Description." The various strengths required are specified in these specifications or the special provisions or are shown on the plans.

- The compressive strength of concrete will be determined from test cylinders that have been fabricated from concrete sampled in conformance with the requirements of California test 539. Test cylinders will be molded and initially field cured in conformance with California Test 540. Test cylinders will be cured and tested after receipt at the testing laboratory in conformance with the requirements of California test 521. A strength test shall consist of the average strength of 2 cylinders fabricated from material taken from a single load of concrete, except that, if any cylinder should show evidence of improper sampling, molding, or testing, that cylinder shall be discarded and the strength test shall consist of the strength of the remaining cylinder.

- When concrete compressive strength is specified as a prerequisite to applying loads or stresses to a concrete structure or member, test cylinders for other than steam cured concrete will be cured in conformance with Method 1 of California Test 540. The compressive strength of concrete determined for these purposes will be evaluated on the basis of individual tests.

- When concrete is designated by 28-day compressive strength rather than by cementitious material content, the concrete strength to be used as a basis for acceptance of other than steam cured concrete will be determined from cylinders cured in conformance with Method 1 of California Test 540. If the result of a single compressive strength test at the maximum age specified or allowed is below the specified strength but is 95 percent or more of the specified strength, the Contractor shall, at the Contractor's expense, make corrective changes, subject to approval of the Engineer, in the mix proportions or in the concrete fabrication procedures, before placing additional concrete, and shall pay to the State \$14 for each in-place cubic meter of concrete represented by the deficient test. If the result of a single compressive strength test at the maximum age specified or allowed is below 95 percent of the specified strength, but is 85 percent or more of the specified strength, the Contractor shall make the corrective changes specified above, and shall pay to the State \$20 for each in place cubic meter of concrete represented by the deficient test. In addition, such corrective changes shall be made when the compressive strength of concrete tested at 7 days indicates, in the judgment of the Engineer, that the concrete will not attain the required compressive strength at the maximum age specified or allowed. Concrete represented by a single test that indicates a compressive strength of less than 85 percent of the specified 28-day compressive strength will be rejected in conformance with the provisions in Section 6-1.04, "Defective Materials."

- If the test result indicates that the compressive strength at the maximum curing age specified or allowed is below the specified strength, but is 85 percent or more of the specified strength, payments to the State as required above shall be made, unless the Contractor, at the Contractor's expense, obtains and submits evidence acceptable to the Engineer that the strength of the concrete placed in the work meets or exceeds the specified 28-day compressive strength. If the test result indicates a compressive strength at the maximum curing age specified or allowed below 85 percent, the concrete represented by that test will be rejected, unless the Contractor, at the Contractor's expense, obtains and submits evidence acceptable to the Engineer that the strength and quality of the concrete placed in the work are acceptable. If the evidence consists of tests made on cores taken from the work, the cores shall be obtained and tested in conformance with the requirements in ASTM Designation: C 42.

- No single compressive strength test shall represent more than 250 m<sup>3</sup>.
- When a precast concrete member is steam cured, the compressive strength of the concrete will be determined from test cylinders that have been handled and stored in conformance with Method 3 of California Test 540. The compressive



strength of steam cured concrete will be evaluated on the basis of individual tests representing specific portions of production. When the concrete is designated by 28-day compressive strength rather than by cementitious material content, the concrete shall be considered to be acceptable whenever its compressive strength reaches the specified 28-day compressive strength provided that strength is reached in not more than the maximum number of days specified or allowed after the member is cast.

- When concrete is specified by compressive strength, prequalification of materials, mix proportions, mixing equipment, and procedures proposed for use will be required prior to placement of the concrete. Prequalification shall be accomplished by the submission of acceptable certified test data or trial batch reports by the Contractor. Prequalification data shall be based on the use of materials, mix proportions, mixing equipment, procedures, and size of batch proposed for use in the work.

- Certified test data, in order to be acceptable, shall indicate that not less than 90 percent of at least 20 consecutive tests exceed the specified strength at the maximum number of cure days specified or allowed, and none of those tests are less than 95 percent of specified strength. Strength tests included in the data shall be the most recent tests made on concrete of the proposed mix design and all shall have been made within one year of the proposed use of the concrete.

- Trial batch test reports, in order to be acceptable, shall indicate that the average compressive strength of 5 consecutive concrete cylinders, taken from a single batch, at not more than 28 days (or the maximum age allowed) after molding shall be at least 4 MPa greater than the specified 28-day compressive strength, and no individual cylinder shall have a strength less than the specified strength at the maximum age specified or allowed. Data contained in the report shall be from trial batches that were produced within one year of the proposed use of specified strength concrete in the project. Whenever air-entrainment is required, the air content of trial batches shall be equal to or greater than the air content specified for the concrete without reduction due to tolerances.

- Tests shall be performed in conformance with either the appropriate California Test methods or the comparable ASTM test methods. Equipment employed in testing shall be in good condition and shall be properly calibrated. If the tests are performed during the life of the contract, the Engineer shall be notified sufficiently in advance of performing the tests in order to witness the test procedures.

- The certified test data and trial batch test reports shall include the following information:

- A. Date of mixing.
- B. Mixing equipment and procedures used.
- C. The size of batch in cubic meters and the mass, type, and source of all ingredients used.
- D. Penetration of the concrete.
- E. The air content of the concrete if an air-entraining admixture is used.
- F. The age at time of testing and strength of all concrete cylinders tested.

- Certified test data and trial batch test reports shall be signed by an official of the firm that performed the tests.

- When approved by the Engineer, concrete from trial batches may be used in the work at locations where concrete of a lower quality is required and the concrete will be paid for as the type or class of concrete required at that location.

- After materials, mix proportions, mixing equipment, and procedures for concrete have been prequalified for use, additional prequalification by testing of trial batches will be required prior to making changes that, in the judgment of the Engineer, could result in a strength of concrete below that specified.

- The Contractor's attention is directed to the time required to test trial batches and the Contractor shall be responsible for production of trial batches at a sufficiently early date so that the progress of the work is not delayed.

- When precast concrete members are manufactured at the plant of an established manufacturer of precast concrete members, the mix proportions of the concrete shall be determined by the Contractor, and a trial batch and prequalification of the materials, mix proportions, mixing equipment, and procedures will not be required.

## **90-10 MINOR CONCRETE**

### **90-10.01 GENERAL**

- Concrete for minor structures, slope paving, curbs, sidewalks and other concrete work, when designated as minor concrete on the plans, in the specifications, or in the contract item, shall conform to the provisions specified herein.

- The Engineer, at the Engineer's discretion, will inspect and test the facilities, materials and methods for producing the concrete to ensure that minor concrete of the quality suitable for use in the work is obtained.

### **90-10.02 MATERIALS**

- Minor concrete shall conform to the following requirements:

#### **90-10.02A Cementitious Material**

- Cementitious material shall conform to the provisions in Section 90-1.01, "Description."

#### **90-10.02B Aggregate**

- Aggregate shall be clean and free from deleterious coatings, clay balls, roots, and other extraneous materials.
- The Contractor shall submit to the Engineer for approval, a grading of the combined aggregate proposed for use in the minor concrete. After acceptance of the grading, aggregate furnished for minor concrete shall conform to that grading, unless a change is authorized in writing by the Engineer.
- The Engineer may require the Contractor to furnish periodic test reports of the aggregate grading furnished. The maximum size of aggregate used shall be at the option of the Contractor, but in no case shall the maximum size be larger than 37.5 mm or smaller than 19 mm.
- The Engineer may waive, in writing, the gradation requirements in this Section 90-10.02B, if, in the Engineer's opinion, the furnishing of the gradation is not necessary for the type or amount of concrete work to be constructed.

#### **90-10.02C Water**

- Water used for washing, mixing, and curing shall be free from oil, salts, and other impurities that would discolor or etch the surface or have an adverse affect on the quality of the concrete.

#### **90-10.02D Admixtures**

- The use of admixtures shall conform to the provisions in Section 90-4, "Admixtures."

### **90-10.03 PRODUCTION**

- Cementitious material, water, aggregate, and admixtures shall be stored, proportioned, mixed, transported, and discharged in conformance with recognized standards of good practice that will result in concrete that is thoroughly and uniformly mixed, that is suitable for the use intended, and that conforms to requirements specified herein. Recognized standards of good practice are outlined in various industry publications such as are issued by American Concrete Institute, AASHTO, or the Department.
- The cementitious material content of minor concrete shall conform to the provisions in Section 90-1.01, "Description."
- The amount of water used shall result in a consistency of concrete conforming to the provisions in Section 90-6.06, "Amount of Water and Penetration." Additional mixing water shall not be incorporated into the concrete during hauling or after arrival at the delivery point, unless authorized by the Engineer.
- Discharge of ready-mixed concrete from the transporting vehicle shall be made while the concrete is still plastic and before stiffening occurs. An elapsed time of 1.5 hours (one hour in non-agitating hauling equipment), or more than 250 revolutions of the drum or blades, after the introduction of the cementitious material to the aggregates, or a temperature of concrete of more than 32°C will be considered conditions contributing to the quick stiffening of concrete. The Contractor shall take whatever action is necessary to eliminate quick stiffening, except that the addition of water will not be permitted.
- The required mixing time in stationary mixers shall be not less than 50 seconds or more than 5 minutes.
- The minimum required revolutions at mixing speed for transit-mixed concrete shall be not less than that recommended by the mixer manufacturer, and shall be increased, if necessary, to produce thoroughly and uniformly mixed concrete.
- Each load of ready-mixed concrete shall be accompanied by a weighmaster certificate that shall be delivered to the Engineer at the discharge location of the concrete, unless otherwise directed by the Engineer. The weighmaster certificate shall be clearly marked with the date and time of day when the load left the batching plant and, if hauled in truck mixers or agitators, the time the mixing cycle started.
- A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall be furnished to the Engineer, prior to placing minor concrete from a source not previously used on the contract, stating that minor concrete to be furnished meets contract requirements, including minimum cementitious material content specified.

### **90-10.04 CURING MINOR CONCRETE**

- Curing minor concrete shall conform to the provisions in Section 90-7, "Curing Concrete."

### **90-10.05 PROTECTING MINOR CONCRETE**

- Protecting minor concrete shall conform to the provisions in Section 90-8, "Protecting Concrete," except the concrete shall be maintained at a temperature of not less than 4°C for 72 hours after placing.

#### **90-10.06 MEASUREMENT AND PAYMENT**

- Minor concrete will be measured and paid for in conformance with the provisions specified in the various sections of these specifications covering concrete construction when minor concrete is specified in the specifications, shown on the plans, or indicated by contract item in the Engineer's Estimate.

#### **90-11 MEASUREMENT AND PAYMENT**

##### **90-11.01 MEASUREMENT**

- Portland cement concrete will be measured in conformance with the provisions specified in the various sections of these specifications covering construction requiring concrete.
- When it is provided that concrete will be measured at the mixer, the volume in cubic meters shall be computed as the total mass of the batch in kilograms divided by the density of the concrete in kilograms per cubic meter. The total mass of the batch shall be calculated as the sum of all materials, including water, entering the batch. The density of the concrete will be determined in conformance with the requirements in California Test 518.

##### **90-11.02 PAYMENT**

- Portland cement concrete will be paid for in conformance with the provisions specified in the various sections of these specifications covering construction requiring concrete.
- Full compensation for furnishing and incorporating admixtures required by these specifications or the special provisions will be considered as included in the contract prices paid for the concrete involved and no additional compensation will be allowed therefor.
- Should the Engineer order the Contractor to incorporate any admixtures in the concrete when their use is not required by these specifications or the special provisions, furnishing the admixtures and adding them to the concrete will be paid for as extra work as provided in Section 4-1.03D, "Extra Work."
- Should the Contractor use admixtures in conformance with the provisions in Section 90-4.05, "Optional Use of Chemical Admixtures," or Section 90-4.07, "Optional Use of Air-entraining Admixtures," or should the Contractor request and obtain permission to use other admixtures for the Contractor's benefit, the Contractor shall furnish those admixtures and incorporate them into the concrete at the Contractor's expense and no additional compensation will be allowed therefor.

## **END OF AMENDMENTS**

### **SECTION 2. PROPOSAL REQUIREMENTS AND CONDITIONS**

#### **2-1.01 GENERAL**

The bidder's attention is directed to the provisions in Section 2, "Proposal Requirements and Conditions," of the Standard Specifications and these special provisions for the requirements and conditions which the bidder must observe in the preparation of the Proposal form and the submission of the bid.

In addition to the subcontractors required to be listed in conformance with Section 2-1.054, "Required Listing of Proposed Subcontractors," of the Standard Specifications, each proposal shall have listed therein the portion of work that will be performed by each subcontractor listed.

The Bidder's Bond form mentioned in the last paragraph in Section 2-1.07, "Proposal Guaranty," of the Standard Specifications will be found following the signature page of the Proposal.

Submit request for substitution of an "or equal" item, and the data substantiating the request to the Department of Transportation, P.O. Box 911, Marysville, CA 95901, Attn: NRCO/Contract Administration Engineer, so that the request is received by the Department by close of business on the fourth day, not including Saturdays, Sundays and legal holidays, following bid opening.

In conformance with Public Contract Code Section 7106, a Noncollusion Affidavit is included in the Proposal. Signing the Proposal shall also constitute signature of the Noncollusion Affidavit.

The contractor, sub recipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate. Each subcontract signed by the bidder must include this assurance.

#### **2-1.015 FEDERAL LOBBYING RESTRICTIONS**

Section 1352, Title 31, United States Code prohibits Federal funds from being expended by the recipient or any lower tier subrecipient of a Federal-aid contract to pay for any person for influencing or attempting to influence a Federal agency or Congress in connection with the awarding of any Federal-aid contract, the making of any Federal grant or loan, or the entering into of any cooperative agreement.

If any funds other than Federal funds have been paid for the same purposes in connection with this Federal-aid contract, the recipient shall submit an executed certification and, if required, submit a completed disclosure form as part of the bid documents.

A certification for Federal-aid contracts regarding payment of funds to lobby Congress or a Federal agency is included in the Proposal. Standard Form - LLL, "Disclosure of Lobbying Activities," with instructions for completion of the Standard Form is also included in the Proposal. Signing the Proposal shall constitute signature of the Certification.

The above-referenced certification and disclosure of lobbying activities shall be included in each subcontract and any lower-tier contracts exceeding \$100,000. All disclosure forms, but not certifications, shall be forwarded from tier to tier until received by the Engineer.

The Contractor, subcontractors and any lower-tier contractors shall file a disclosure form at the end of each calendar quarter in which there occurs any event that requires disclosure or that materially affects the accuracy of the information contained in any disclosure form previously filed by the Contractor, subcontractors and any lower-tier contractors. An event that materially affects the accuracy of the information reported includes:

- A. A cumulative increase of \$25,000 or more in the amount paid or expected to be paid for influencing or attempting to influence a covered Federal action; or
- B. A change in the person(s) or individual(s) influencing or attempting to influence a covered Federal action; or,
- C. A change in the officer(s), employee(s), or Member(s) contacted to influence or attempt to influence a covered Federal action.

#### **2-1.02 DISADVANTAGED BUSINESS ENTERPRISE (DBE)**

This project is subject to Part 26, Title 49, Code of Federal Regulations entitled "Participation by Disadvantaged Business Enterprises in Department of Transportation Financial Assistance Programs." The Regulations in their entirety are incorporated herein by this reference.

Bidders shall be fully informed respecting the requirements of the Regulations and the Department's Disadvantaged Business Enterprise (DBE) program developed pursuant to the Regulations; particular attention is directed to the following matters:

- A. A DBE must be a small business concern as defined pursuant to Section 3 of U.S. Small Business Act and relevant regulations promulgated pursuant thereto.
- B. A DBE may participate as a prime contractor, subcontractor, joint venture partner with a prime or subcontractor, vendor of material or supplies, or as a trucking company.
- C. A DBE bidder, not bidding as a joint venture with a non-DBE, will be required to document one or a combination of the following:
  - 1. The bidder will meet the goal by performing work with its own forces.
  - 2. The bidder will meet the goal through work performed by DBE subcontractors, suppliers or trucking companies.
  - 3. The bidder, prior to bidding, made adequate good faith efforts to meet the goal.
- D. A DBE joint venture partner must be responsible for specific contract items of work, or portions thereof. Responsibility means actually performing, managing and supervising the work with its own forces. The DBE joint venture partner must share in the capital contribution, control, management, risks and profits of the joint venture. The DBE joint venturer must submit the joint venture agreement with the proposal or the DBE Information form required in the Section entitled "Submission of DBE Information" of these special provisions.
- E. A DBE must perform a commercially useful function, i.e., must be responsible for the execution of a distinct element of the work and must carry out its responsibility by actually performing, managing and supervising the work.
- F. DBEs must be certified by the California Unified Certification Program (CUCP). It is the contractor's responsibility to confirm that the firm is DBE certified as of the date of bid opening. Listings of DBEs certified by the CUCP are available from the following sources:
  - 1. The Department's DBE Directory, which is published quarterly. This Directory may be obtained from the

Department of Transportation, Materiel Operations Branch, Publication Distribution Unit, 1900 Royal Oaks Drive, Sacramento, California 95815, Telephone: (916) 445-3520.

2. The Department's web site at <http://www.dot.ca.gov/hq/bep>.
3. The organizations listed in the Section entitled "DBE Goal for this Project" of these special provisions.

G. Credit for materials or supplies purchased from DBEs will be as follows:

1. If the materials or supplies are obtained from a DBE manufacturer, 100 percent of the cost of the materials or supplies will count toward the DBE goal. A DBE manufacturer is a firm that operates or maintains a factory or establishment that produces, on the premises, the materials, supplies, articles, or equipment required under the contract and of the general character described by the specifications.
2. If the materials or supplies are purchased from a DBE regular dealer, 60 percent of the cost of the materials or supplies will count toward the DBE goal. A DBE regular dealer is a firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials, supplies, articles or equipment of the general character described by the specifications and required under the contract are bought, kept in stock, and regularly sold or leased to the public in the usual course of business. To be a DBE regular dealer, the firm must be an established, regular business that engages, as its principal business and under its own name, in the purchase and sale or lease of the products in question. A person may be a DBE regular dealer in such bulk items as petroleum products, steel, cement, gravel, stone, or asphalt without owning, operating, or maintaining a place of business as provided in this paragraph G.2. if the person both owns and operates distribution equipment for the products. Any supplementing of regular dealers' own distribution equipment shall be by a long-term lease agreement and not on an ad hoc or contract-by-contract basis. Packagers, brokers, manufacturers' representatives, or other persons who arrange or expedite transactions are not DBE regular dealers within the meaning of this paragraph G.2.
3. Credit for materials or supplies purchased from a DBE which is neither a manufacturer nor a regular dealer will be limited to the entire amount of fees or commissions charged for assistance in the procurement of the materials and supplies, or fees or transportation charges for the delivery of materials or supplies required on a job site, provided the fees are reasonable and not excessive as compared with fees charged for similar services.

H. Credit for DBE trucking companies will be as follows:

1. The DBE must be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular contract, and there cannot be a contrived arrangement for the purpose of meeting the DBE goal.
2. The DBE must itself own and operate at least one fully licensed, insured, and operational truck used on the contract.
3. The DBE receives credit for the total value of the transportation services it provides on the contract using trucks it owns, insures, and operates using drivers it employs.
4. The DBE may lease trucks from another DBE firm, including an owner-operator who is certified as a DBE. The DBE who leases trucks from another DBE receives credit for the total value of the transportation services the lessee DBE provides on the contract.
5. The DBE may also lease trucks from a non-DBE firm, including an owner-operator. The DBE who leases trucks from a non-DBE is entitled to credit only for the fee or commission it receives as a result of the lease arrangement. The DBE does not receive credit for the total value of the transportation services provided by the lessee, since these services are not provided by a DBE.
6. For the purposes of this paragraph H, a lease must indicate that the DBE has exclusive use of and control over the truck. This does not preclude the leased truck from working for others during the term of the lease with the consent of the DBE, so long as the lease gives the DBE absolute priority for use of the leased truck. Leased trucks must display the name and identification number of the DBE.

- I. Noncompliance by the Contractor with the requirements of the regulations constitutes a breach of this contract and may result in termination of the contract or other appropriate remedy for a breach of this contract.
- J. Bidders are encouraged to use services offered by financial institutions owned and controlled by DBEs.

## 2-1.02A DBE GOAL FOR THIS PROJECT

The Department has established the following goal for Disadvantaged Business Enterprise (DBE) participation for this project:

Disadvantaged Business Enterprise (DBE): 17 percent

Bidders may use the services of the following firms to contact interested DBEs. These firms are available to assist DBEs in preparing bids for subcontracting or supplying materials.

The following firms may be contacted for projects in the following locations:

Districts 04, 05 (except San Luis Obispo and Santa Barbara Counties), 06 (except Kern County) and 10:	Districts 08 and 11:
Triaxial Management Services, Inc. - Oakland  1545 Willow Street, 1st Floor Oakland, CA 94607 Telephone: (510) 286-1313 FAX No.: (510) 286-6792	Padilla & Associates - San Diego  2725 Congress Street, Suite 1D San Diego, CA 92110 Telephone: (619) 725-0843 FAX No.: (619) 725-0854
Districts 07, 08, and 12; in San Luis Obispo and Santa Barbara Counties in District 05; and in Kern County in District 06:	Districts 01, 02, 03 and 09:
Padilla & Associates - Los Angeles  5675 East Telegraph Rd., Suite A-260 Los Angeles, CA 90040 Telephone: (323) 728-8847 FAX No.: (323) 728-8867	Triaxial Management Services, Inc. - Sacramento  930 Alhambra Blvd., #205 Sacramento, CA 95816 Telephone: (916) 553-4172 FAX No.: (916) 553-4173

## 2-1.02B SUBMISSION OF DBE INFORMATION

The required DBE information shall be submitted on the "CALTRANS BIDDER - DBE INFORMATION" form included in the Proposal. If the DBE information is not submitted with the bid, the DBE Information form shall be removed from the documents prior to submitting the bid.

It is the bidder's responsibility to make enough work available to DBEs and to select those portions of the work or material needs consistent with the available DBEs to meet the goal for DBE participation or to provide information to establish that, prior to bidding, the bidder made adequate good faith efforts to do so.

If DBE information is not submitted with the bid, the apparent successful bidder (low bidder), the second low bidder and the third low bidder shall submit DBE information to the Department of Transportation, 1120 N Street, Room 0200, MS #26, Sacramento, California 95814 so the information is received by the Department no later than 4:00 p.m. on the fourth day, not including Saturdays, Sundays and legal holidays, following bid opening. DBE information sent by U.S. Postal Service certified mail with return receipt and certificate of mailing and mailed on or before the third day, not including Saturdays, Sundays and legal holidays, following bid opening will be accepted even if it is received after the fourth day following bid opening. Failure to submit the required DBE information by the time specified will be grounds for finding the bid or proposal nonresponsive. Other bidders need not submit DBE information unless requested to do so by the Department.

The bidder's DBE information shall establish that good faith efforts to meet the DBE goal have been made. To establish good faith efforts, the bidder shall demonstrate that the goal will be met or that, prior to bidding, adequate good faith efforts to meet the goal were made.

Bidders are cautioned that even though their submittal indicates they will meet the stated DBE goal, their submittal should also include their adequate good faith efforts information along with their DBE goal information to protect their eligibility for award of the contract in the event the Department, in its review, finds that the goal has not been met.

The bidder's DBE information shall include the names, addresses and phone numbers of DBE firms that will participate, with a complete description of work or supplies to be provided by each, the dollar value of each DBE transaction, and a written confirmation from the DBE that it is participating in the contract. A copy of the DBE's quote will serve as written confirmation that the DBE is participating in the contract. When 100 percent of a contract item of work is not to be performed or furnished by a DBE, a description of the exact portion of that work to be performed or furnished by that DBE shall be included in the DBE information, including the planned location of that work. The work that a DBE prime contractor has committed to performing with its own forces as well as the work that it has committed to be performed by DBE subcontractors, suppliers and trucking companies will count toward the goal.

The information necessary to establish the bidder's adequate good faith efforts to meet the DBE goal should include:

- A. The names and dates of each publication in which a request for DBE participation for this project was placed by the bidder.
- B. The names and dates of written notices sent to certified DBEs soliciting bids for this project and the dates and methods used for following up initial solicitations to determine with certainty whether the DBEs were interested.
- C. The items of work which the bidder made available to DBE firms, including, where appropriate, any breaking down of the contract work items (including those items normally performed by the bidder with its own forces) into economically feasible units to facilitate DBE participation. It is the bidder's responsibility to demonstrate that sufficient work to meet the DBE goal was made available to DBE firms.
- D. The names, addresses and phone numbers of rejected DBE firms, the firms selected for that work, and the reasons for the bidder's choice.
- E. Efforts made to assist interested DBEs in obtaining bonding, lines of credit or insurance, and any technical assistance or information related to the plans, specifications and requirements for the work which was provided to DBEs.
- F. Efforts made to assist interested DBEs in obtaining necessary equipment, supplies, materials, or related assistance or services, excluding supplies and equipment the DBE subcontractor purchases or leases from the prime contractor or its affiliate.
- G. The names of agencies contacted to provide assistance in contacting, recruiting and using DBE firms.
- H. Any additional data to support a demonstration of good faith efforts.

### **SECTION 3. AWARD AND EXECUTION OF CONTRACT**

The bidder's attention is directed to the provisions in Section 3, "Award and Execution of Contract," of the Standard Specifications and these special provisions for the requirements and conditions concerning award and execution of contract.

The award of the contract, if it be awarded, will be to the lowest responsible bidder whose proposal complies with all the requirements prescribed and who has met the goal for DBE participation or has demonstrated, to the satisfaction of the Department, adequate good faith efforts to do so. Meeting the goal for DBE participation or demonstrating, to the satisfaction of the Department, adequate good faith efforts to do so is a condition for being eligible for award of contract.

The contract shall be executed by the successful bidder and shall be returned, together with the contract bonds, to the Department so that it is received within 10 days, not including Saturdays, Sundays and legal holidays, after the bidder has received the contract for execution. Failure to do so shall be just cause for forfeiture of the proposal guaranty. The executed contract documents shall be delivered to the following address: Department of Transportation MS 43, Attn: Office Engineer, 1727 30th Street, Sacramento, CA 95816.

A "Payee Data Record" form will be included in the contract documents to be executed by the successful bidder. The purpose of the form is to facilitate the collection of taxpayer identification data. The form shall be completed and returned to the Department by the successful bidder with the executed contract and contract bonds. For the purposes of the form, payee shall be deemed to mean the successful bidder. The form is not to be completed for subcontractors or suppliers. Failure to complete and return the "Payee Data Record" form to the Department as provided herein will result in the retention of 31 percent of payments due the contractor and penalties of up to \$20,000. This retention of payments for failure to complete the "Payee Data Record" form is in addition to any other retention of payments due the Contractor.

### **SECTION 4. BEGINNING OF WORK, TIME OF COMPLETION AND LIQUIDATED DAMAGES**

Attention is directed to the provisions in Section 8-1.03, "Beginning of Work," in Section 8-1.06, "Time of Completion," and in Section 8-1.07, "Liquidated Damages," of the Standard Specifications and these special provisions.

The Contractor shall begin work within 45 calendar days after the contract has been approved by the Attorney General or the attorney appointed and authorized to represent the Department of Transportation.

The work shall be diligently prosecuted to completion before the expiration of **360 WORKING DAYS** beginning on the date that work begins or beginning on the forty-fifth calendar day after approval of the contract, whichever occurs first.

The Contractor shall pay to the State of California the sum of \$ 9,700.00 per day, for each and every calendar day's

delay in finishing the work in excess of the number of working days prescribed above.

The 72 hours advance notice before beginning work referred to in Section 8-1.03, "Beginning of Work," of the Standard Specifications is changed to 5 days advance notice for this project.

## **SECTION 5. GENERAL**

### **SECTION 5-1. MISCELLANEOUS**

#### **5-1.01 PLANS AND WORKING DRAWINGS**

When the specifications require working drawings to be submitted to the Division of Structure Design, the drawings shall be submitted to: Division of Structure Design, Documents Unit, Mail Station 9, 1801 30th Street, Sacramento, CA 95816, Telephone 916 227-8252.

#### **5-1.011 EXAMINATION OF PLANS, SPECIFICATIONS, CONTRACT, AND SITE OF WORK**

Attention is directed to "Differing Site Conditions" of these special provisions regarding physical conditions at the site which may differ from those indicated in "Materials Information," log of test borings or other geotechnical information obtained by the Department's investigation of site conditions.

#### **5-1.012 DIFFERING SITE CONDITIONS**

Attention is directed to Section 5-1.116, "Differing Site Conditions," of the Standard Specifications.

During the progress of the work, if subsurface or latent conditions are encountered at the site differing materially from those indicated in the "Materials Information," log of test borings, other geotechnical data obtained by the Department's investigation of subsurface conditions, or an examination of the conditions above ground at the site, the party discovering those conditions shall promptly notify the other party in writing of the specific differing conditions before they are disturbed and before the affected work is performed.

The Contractor will be allowed 15 days from the notification of the Engineer's determination of whether or not an adjustment of the contract is warranted, in which to file a notice of potential claim in conformance with the provisions of Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications and as specified herein; otherwise the decision of the Engineer shall be deemed to have been accepted by the Contractor as correct. The notice of potential claim shall set forth in what respects the Contractor's position differs from the Engineer's determination and provide any additional information obtained by the Contractor, including but not limited to additional geotechnical data. The notice of potential claim shall be accompanied by the Contractor's certification that the following were made in preparation of the bid: a review of the contract, a review of the "Materials Information," a review of the log of test borings and other records of geotechnical data to the extent they were made available to bidders prior to the opening of bids, and an examination of the conditions above ground at the site. Supplementary information, obtained by the Contractor subsequent to the filing of the notice of potential claim, shall be submitted to the Engineer in an expeditious manner.

#### **5-1.013 LINES AND GRADES**

Attention is directed to Section 5-1.07, "Lines and Grades," of the Standard Specifications.

Stakes or marks will be set by the Engineer in conformance with the requirements in Chapter 12, "Construction Surveys," of the Department's Surveys Manual.

#### **5-1.015 LABORATORY**

When a reference is made in the specifications to the "Laboratory," the reference shall mean Division of Engineering Services - Materials Engineering and Testing Services and Division of Engineering Services - Geotechnical Services of the Department of Transportation, or established laboratories of the various Districts of the Department, or other laboratories authorized by the Department to test materials and work involved in the contract. When a reference is made in the specifications to the "Transportation Laboratory," the reference shall mean Division of Engineering Services - Materials Engineering and Testing Services and Division of Engineering Services - Geotechnical Services, located at 5900 Folsom Boulevard, Sacramento, CA 95819, Telephone (916) 227-7000.

#### **5-1.017 CONTRACT BONDS**

Attention is directed to Section 3-1.02, "Contract Bonds," of the Standard Specifications and these special provisions.

The payment bond shall be in a sum not less than one hundred percent of the total amount payable by the terms of the contract.



### **5-1.019 COST REDUCTION INCENTIVE**

Attention is directed to Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications.

Prior to preparing a written cost reduction proposal, the Contractor shall request a meeting with the Engineer to discuss the proposal in concept. Items of discussion will also include permit issues, impact on other projects, impact on the project schedule, peer reviews, overall merit of the proposal, and review times required by the Department and other agencies.

If a cost reduction proposal submitted by the Contractor, and subsequently approved by the Engineer, provides for a reduction in contract time, 50 percent of that contract time reduction shall be credited to the State by reducing the contract working days, not including plant establishment. Attention is directed to "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions regarding the working days.

If a cost reduction proposal submitted by the Contractor, and subsequently approved by the Engineer, provides for a reduction in traffic congestion or avoids traffic congestion during construction, 60 percent of the estimated net savings in construction costs attributable to the cost reduction proposal will be paid to the Contractor. In addition to the requirements in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications, the Contractor shall provide detailed comparisons of the traffic handling between the existing contract and the proposed change, and estimates of the traffic volumes and congestion.

### **5-1.02 LABOR NONDISCRIMINATION**

Attention is directed to the following Notice that is required by Chapter 5 of Division 4 of Title 2, California Code of Regulations.

#### **NOTICE OF REQUIREMENT FOR NONDISCRIMINATION PROGRAM**

##### **(GOV. CODE, SECTION 12990)**

Your attention is called to the "Nondiscrimination Clause", set forth in Section 7-1.01A(4), "Labor Nondiscrimination," of the Standard Specifications, which is applicable to all nonexempt State contracts and subcontracts, and to the "Standard California Nondiscrimination Construction Contract Specifications" set forth therein. The specifications are applicable to all nonexempt State construction contracts and subcontracts of \$5000 or more.

### **5-1.022 PAYMENT OF WITHHELD FUNDS**

Payment of withheld funds shall conform to Section 9-1.065, "Payment of Withheld Funds," of the Standard Specifications and these special provisions.

Funds withheld from progress payments to ensure performance of the contract that are eligible for payment into escrow or to an escrow agent pursuant to Section 10263 of the California Public Contract Code do not include funds withheld or deducted from payment due to failure of the Contractor to fulfill a contract requirement.

### **5-1.03 INTEREST ON PAYMENTS**

Interest shall be payable on progress payments, payments after acceptance, final payments, extra work payments, and claim payments as follows:

- A. Unpaid progress payments, payment after acceptance, and final payments shall begin to accrue interest 30 days after the Engineer prepares the payment estimate.
- B. Unpaid extra work bills shall begin to accrue interest 30 days after preparation of the first pay estimate following receipt of a properly submitted and undisputed extra work bill. To be properly submitted, the bill must be submitted within 7 days of the performance of the extra work and in conformance with the provisions in Section 9-1.03C, "Records," and Section 9-1.06, "Partial Payments," of the Standard Specifications. An undisputed extra work bill not submitted within 7 days of performance of the extra work will begin to accrue interest 30 days after the preparation of the second pay estimate following submittal of the bill.
- C. The rate of interest payable for unpaid progress payments, payments after acceptance, final payments, and extra work payments shall be 10 percent per annum.
- D. The rate of interest payable on a claim, protest or dispute ultimately allowed under this contract shall be 6 percent per annum. Interest shall begin to accrue 61 days after the Contractor submits to the Engineer information in sufficient detail to enable the Engineer to ascertain the basis and amount of said claim, protest or dispute.

The rate of interest payable on any award in arbitration shall be 6 percent per annum if allowed under the provisions of Civil Code Section 3289.

#### 5-1.04 PUBLIC SAFETY

The Contractor shall provide for the safety of traffic and the public in conformance with the provisions in Section 7-1.09, "Public Safety," of the Standard Specifications and these special provisions.

The Contractor shall install temporary railing (Type K) between a lane open to public traffic and an excavation, obstacle or storage area when the following conditions exist:

- A. Excavations.—The near edge of the excavation is 3.6 m or less from the edge of the lane, except:
  - 1. Excavations covered with sheet steel or concrete covers of adequate thickness to prevent accidental entry by traffic or the public.
  - 2. Excavations less than 0.3-m deep.
  - 3. Trenches less than 0.3-m wide for irrigation pipe or electrical conduit, or excavations less than 0.3-m in diameter.
  - 4. Excavations parallel to the lane for the purpose of pavement widening or reconstruction.
  - 5. Excavations in side slopes, where the slope is steeper than 1:4 (vertical:horizontal).
  - 6. Excavations protected by existing barrier or railing.
- B. Temporarily Unprotected Permanent Obstacles.—The work includes the installation of a fixed obstacle together with a protective system, such as a sign structure together with protective railing, and the Contractor elects to install the obstacle prior to installing the protective system; or the Contractor, for the Contractor's convenience and with permission of the Engineer, removes a portion of an existing protective railing at an obstacle and does not replace such railing complete in place during the same day.
- C. Storage Areas.—Material or equipment is stored within 3.6 m of the lane and the storage is not otherwise prohibited by the provisions of the Standard Specifications and these special provisions.

The approach end of temporary railing (Type K), installed in conformance with the provisions in this section "Public Safety" and in Section 7-1.09, "Public Safety," of the Standard Specifications, shall be offset a minimum of 4.6 m from the edge of the traffic lane open to public traffic. The temporary railing shall be installed on a skew toward the edge of the traffic lane of not more than 0.3-m transversely to 3 m longitudinally with respect to the edge of the traffic lane. If the 4.6-m minimum offset cannot be achieved, the temporary railing shall be installed on the 10 to 1 skew to obtain the maximum available offset between the approach end of the railing and the edge of the traffic lane, and an array of temporary crash cushion modules shall be installed at the approach end of the temporary railing.

Temporary railing (Type K) shall conform to the provisions in Section 12-3.08, "Temporary Railing (Type K)," of the Standard Specifications. Temporary railing (Type K), conforming to the details shown on 1999 Standard Plan T3, may be used. Temporary railing (Type K) fabricated prior to January 1, 1993, and conforming to 1988 Standard Plan B11-30 may be used, provided the fabrication date is printed on the required Certificate of Compliance.

Temporary crash cushion modules shall conform to the provisions in "Temporary Crash Cushion Module" of these special provisions.

Except for installing, maintaining and removing traffic control devices, whenever work is performed or equipment is operated in the following work areas, the Contractor shall close the adjacent traffic lane unless otherwise provided in the Standard Specifications and these special provisions:

Approach Speed of Public Traffic (Posted Limit) (Kilometers Per Hour)	Work Areas
Over 72 (45 Miles Per Hour)	Within 1.8 m of a traffic lane but not on a traffic lane
56 to 72 (35 to 45 Miles Per Hour)	Within 0.9-m of a traffic lane but not on a traffic lane

The lane closure provisions of this section shall not apply if the work area is protected by permanent or temporary railing or barrier.

When traffic cones or delineators are used to delineate a temporary edge of a traffic lane, the line of cones or delineators shall be considered to be the edge of the traffic lane, however, the Contractor shall not reduce the width of an existing lane to less than 3 m without written approval from the Engineer.

When work is not in progress on a trench or other excavation that required closure of an adjacent lane, the traffic cones or portable delineators used for the lane closure shall be placed off of and adjacent to the edge of the traveled way. The spacing of the cones or delineators shall be not more than the spacing used for the lane closure.

Suspended loads or equipment shall not be moved nor positioned over public traffic or pedestrians.

Full compensation for conforming to the provisions in this section "Public Safety," including furnishing and installing

temporary railing (Type K) and temporary crash cushion modules, shall be considered as included in the contract prices paid for the various items of work involved and no additional compensation will be allowed therefor.

#### **5-1.05 TESTING**

Testing of materials and work shall conform to the provisions in Section 6-3, "Testing," of the Standard Specifications and these special provisions.

Whenever the provisions of Section 6-3.01, "General," of the Standard Specifications refer to tests or testing, it shall mean tests to assure the quality and to determine the acceptability of the materials and work.

The Engineer will deduct the costs for testing of materials and work found to be unacceptable, as determined by the tests performed by the Department, and the costs for testing of material sources identified by the Contractor which are not used for the work, from moneys due or to become due to the Contractor. The amount deducted will be determined by the Engineer.

#### **5-1.06 REMOVAL OF ASBESTOS AND HAZARDOUS SUBSTANCES**

When the presence of asbestos or hazardous substances are not shown on the plans or indicated in the specifications and the Contractor encounters materials which the Contractor reasonably believes to be asbestos or a hazardous substance as defined in Section 25914.1 of the Health and Safety Code, and the asbestos or hazardous substance has not been rendered harmless, the Contractor may continue work in unaffected areas reasonably believed to be safe. The Contractor shall immediately cease work in the affected area and report the condition to the Engineer in writing.

In conformance with Section 25914.1 of the Health and Safety Code, removal of asbestos or hazardous substances including exploratory work to identify and determine the extent of the asbestos or hazardous substance will be performed by separate contract.

If delay of work in the area delays the current controlling operation, the delay will be considered a right of way delay and the Contractor will be compensated for the delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

#### **5-1.07 YEAR 2000 COMPLIANCE**

This contract is subject to Year 2000 Compliance for automated devices in the State of California.

Year 2000 compliance for automated devices in the State of California is achieved when embedded functions have or create no logical or mathematical inconsistencies when dealing with dates prior to and beyond 1999. The year 2000 is recognized and processed as a leap year. The product shall operate accurately in the manner in which the product was intended for date operation without requiring manual intervention.

The Contractor shall provide the Engineer a Certificate of Compliance from the manufacturer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for all automated devices furnished for the project.

#### **5-1.075 BUY AMERICA REQUIREMENTS**

Attention is directed to the "Buy America" requirements of the Surface Transportation Assistance Act of 1982 (Section 165) and the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) Sections 1041(a) and 1048(a), and the regulations adopted pursuant thereto. In conformance with the law and regulations, all manufacturing processes for steel and iron materials furnished for incorporation into the work on this project shall occur in the United States; with the exception that pig iron and processed, pelletized and reduced iron ore manufactured outside of the United States may be used in the domestic manufacturing process for such steel and iron materials. The application of coatings, such as epoxy coating, galvanizing, painting, and other coatings that protect or enhance the value of steel or iron materials shall be considered a manufacturing process subject to the "Buy America" requirements.

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications shall be furnished for steel and iron materials. The certificates, in addition to certifying that the materials comply with the specifications, shall specifically certify that all manufacturing processes for the materials occurred in the United States, except for the above exceptions.

The requirements imposed by the law and regulations do not prevent a minimal use of foreign steel and iron materials if the total combined cost of the materials used does not exceed one-tenth of one percent (0.1 percent) of the total contract cost or \$2500, whichever is greater. The Contractor shall furnish the Engineer acceptable documentation of the quantity and value of the foreign steel and iron prior to incorporating the materials into the work.

#### **5-1.08 SUBCONTRACTOR AND DBE RECORDS**

The Contractor shall maintain records showing the name and business address of each first-tier subcontractor. The records shall also show the name and business address of every DBE subcontractor, DBE vendor of materials and DBE

trucking company, regardless of tier. The records shall show the date of payment and the total dollar figure paid to all of these firms. DBE prime contractors shall also show the date of work performed by their own forces along with the corresponding dollar value of the work.

Upon completion of the contract, a summary of these records shall be prepared on Form CEM-2402 (F) and certified correct by the Contractor or the Contractor's authorized representative, and shall be furnished to the Engineer. The form shall be furnished to the Engineer within 90 days from the date of contract acceptance. \$10,000 will be withheld from payment until the Form CEM-2402 (F) is submitted. The amount will be returned to the Contractor when a satisfactory Form CEM-2402 (F) is submitted.

Prior to the fifteenth of each month, the Contractor shall submit documentation to the Engineer showing the amount paid to DBE trucking companies listed in the Contractor's DBE information. This monthly documentation shall indicate the portion of the revenue paid to DBE trucking companies which is claimed toward DBE participation. The Contractor shall also obtain and submit documentation to the Engineer showing the amount paid by DBE trucking companies to all firms, including owner-operators, for the leasing of trucks. The DBE who leases trucks from a non-DBE is entitled to credit only for the fee or commission it receives as a result of the lease arrangement. The records must confirm that the amount of credit claimed toward DBE participation conforms with Section 2-1.02, "Disadvantaged Business Enterprise," of these special provisions.

The Contractor shall also obtain and submit documentation to the Engineer showing the truck number, owner's name, California Highway Patrol CA number, and if applicable, the DBE certification number of the owner of the truck for all trucks used during that month for which DBE participation will be claimed. This documentation shall be submitted on Form CEM-2404 (F).

#### **5-1.083 DBE CERTIFICATION STATUS**

If a DBE subcontractor is decertified during the life of the project, the decertified subcontractor shall notify the Contractor in writing with the date of decertification. If a subcontractor becomes a certified DBE during the life of the project, the subcontractor shall notify the Contractor in writing with the date of certification. The Contractor shall furnish the written documentation to the Engineer.

Upon completion of the contract, Form CEM-2403 (F) indicating the DBE's existing certification status shall be signed and certified correct by the Contractor. The certified form shall be furnished to the Engineer within 90 days from the date of contract acceptance.

#### **5-1.086 PERFORMANCE OF DBE SUBCONTRACTORS AND SUPPLIERS**

The DBEs listed by the Contractor in response to the provisions in Section 2-1.02B, "Submission of DBE Information," and Section 3, "Award and Execution of Contract," of these special provisions, which are determined by the Department to be certified DBEs, shall perform the work and supply the materials for which they are listed, unless the Contractor has received prior written authorization to perform the work with other forces or to obtain the materials from other sources.

Authorization to use other forces or sources of materials may be requested for the following reasons:

- A. The listed DBE, after having had a reasonable opportunity to do so, fails or refuses to execute a written contract, when such written contract, based upon the general terms, conditions, plans and specifications for the project, or on the terms of such subcontractor's or supplier's written bid, is presented by the Contractor.
- B. The listed DBE becomes bankrupt or insolvent.
- C. The listed DBE fails or refuses to perform the subcontract or furnish the listed materials.
- D. The Contractor stipulated that a bond was a condition of executing a subcontract and the listed DBE subcontractor fails or refuses to meet the bond requirements of the Contractor.
- E. The work performed by the listed subcontractor is substantially unsatisfactory and is not in substantial conformance with the plans and specifications, or the subcontractor is substantially delaying or disrupting the progress of the work.
- F. It would be in the best interest of the State.

The Contractor shall not be entitled to any payment for such work or material unless it is performed or supplied by the listed DBE or by other forces (including those of the Contractor) pursuant to prior written authorization of the Engineer.

#### **5-1.09 SUBCONTRACTING**

Attention is directed to the provisions in Section 8-1.01, "Subcontracting," of the Standard Specifications, and Section 2, "Proposal Requirements and Conditions," and Section 3, "Award and Execution of Contract," of these special provisions.

Pursuant to the provisions of Section 1777.1 of the Labor Code, the Labor Commissioner publishes and distributes a list of contractors ineligible to perform work as a subcontractor on a public works project. This list of debarred contractors is

available from the Department of Industrial Relations web site at:

<http://www.dir.ca.gov/DLSE/Debar.html>.

The provisions in the third paragraph of Section 8-1.01, "Subcontracting," of the Standard Specifications, that the Contractor shall perform with the Contractor's own organization contract work amounting to not less than 50 percent of the original contract price, is not changed by the Federal Aid requirement specified under "Required Contract Provisions Federal-Aid Construction Contracts" in Section 14 of these special provisions that the Contractor perform not less than 30 percent of the original contract work with the Contractor's own organization.

Each subcontract and any lower tier subcontract that may in turn be made shall include the "Required Contract Provisions Federal-Aid Construction Contracts" in Section 14 of these special provisions. This requirement shall be enforced as follows:

- A. Noncompliance shall be corrected. Payment for subcontracted work involved will be withheld from progress payments due, or to become due, until correction is made. Failure to comply may result in termination of the contract.

In conformance with the Federal DBE regulations Sections 26.53(f)(1) and 26.53(f)(2) Part 26, Title 49 CFR:

- A. The Contractor shall not terminate for convenience a DBE subcontractor listed in response to Section 2-1.02B, "Submission of DBE Information," and then perform that work with its own forces, or those of an affiliate without the written consent of the Department, and
- B. If a DBE subcontractor is terminated or fails to complete its work for any reason, the Contractor will be required to make good faith efforts to substitute another DBE subcontractor for the original DBE subcontractor, to the extent needed to meet the contract goal.

The requirement in Section 2-1.02, "Disadvantaged Business Enterprise (DBE)," of these special provisions that DBEs must be certified on the date bids are opened does not apply to DBE substitutions after award of the contract.

#### **5-1.10 PROMPT PROGRESS PAYMENT TO SUBCONTRACTORS**

Attention is directed to the provisions in Sections 10262 and 10262.5 of the Public Contract Code and Section 7108.5 of the Business and Professions Code concerning prompt payment to subcontractors.

#### **5-1.102 PROMPT PAYMENT OF WITHHELD FUNDS TO SUBCONTRACTORS**

The Contractor shall return all moneys withheld in retention from the subcontractor within 30 days after receiving payment for work satisfactorily completed, even if the other contract work is not completed and has not been accepted in conformance with Section 7-1.17, "Acceptance of Contract," of the Standard Specifications. This requirement shall not be construed to limit or impair any contractual, administrative, or judicial remedies otherwise available to the Contractor or subcontractor in the event of a dispute involving late payment or nonpayment by the Contractor or deficient subcontract performance or noncompliance by a subcontractor.

#### **5-1.103 RECORDS**

The Contractor shall maintain cost accounting records for the contract pertaining to, and in such a manner as to provide a clear distinction between, the following six categories of costs of work during the life of the contract:

- A. Direct costs of contract item work.
- B. Direct costs of changes in character in conformance with Section 4-1.03C, "Changes in Character of Work," of the Standard Specifications.
- C. Direct costs of extra work in conformance with Section 4-1.03D, "Extra Work," of the Standard Specifications.
- D. Direct costs of work not required by the contract and performed for others.
- E. Direct costs of work performed under a notice of potential claim in conformance with the provisions in Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications.
- F. Indirect costs of overhead.

Cost accounting records shall include the information specified for daily extra work reports in Section 9-1.03C, "Records," of the Standard Specifications. The requirements for furnishing the Engineer completed daily extra work reports

shall only apply to work paid for on a force account basis.

The cost accounting records for the contract shall be maintained separately from other contracts, during the life of the contract, and for a period of not less than 3 years after the date of acceptance of the contract. If the Contractor intends to file claims against the Department, the Contractor shall keep the cost accounting records specified above until complete resolution of all claims has been reached.

#### **5-1.11 PARTNERING**

The State will promote the formation of a "Partnering" relationship with the Contractor in order to effectively complete the contract to the benefit of both parties. The purpose of this relationship is to maintain a cooperative communication and to mutually resolve conflicts at the lowest responsible management level.

The Contractor may request the formation of a "Partnering" relationship by submitting a request in writing to the Engineer after approval of the contract. If the Contractor's request for "Partnering" is approved by the Engineer, scheduling of a "Partnering Workshop," selecting the "Partnering" facilitator and workshop site, and other administrative details shall be as agreed to by both parties. If agreed to by the parties, additional "Partnering Workshops" will be conducted as needed throughout the life of the contract.

The costs involved in providing the "Partnering Workshop" facilitator and workshop site will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost in providing the "Partnering Workshop" facilitator and workshop site in conformance with the provisions in Section 9-1.03B, "Work Performed by Special Forces or Other Special Services," of the Standard Specifications, and paying to the Contractor one-half of that cost, except no markups will be allowed.

All other costs associated with "Partnering Workshops" will be borne separately by the party incurring the costs, such as wages and travel expenses, and no additional compensation will be allowed therefor.

The establishment of a "Partnering" relationship will not change or modify the terms and conditions of the contract and will not relieve either party of the legal requirements of the contract.

#### **5-1.114 VALUE ANALYSIS**

The Contractor may submit to the Engineer, in writing, a request for a "Value Analysis" workshop. The purpose for having a workshop is to identify value enhancing opportunities and to consider modifications to the plans and specifications that will reduce either the total cost, time of construction or traffic congestion, without impairing, in any manner, the essential functions or characteristics of the project including, but not limited to, service life, economy of operation, ease of maintenance, benefits to the travelling public, desired appearance, or design and safety standards.

To maximize the potential benefits of a workshop, the request should be submitted to the Engineer early in the project after approval of the contract. If the Contractor's request for a "Value Analysis" workshop is approved by the Engineer, scheduling of a workshop, selecting the facilitator and workshop site, and other administrative details shall be determined cooperatively by the Contractor and the Engineer.

The workshop shall be conducted in conformance with the methodology described in the Department's "Value Analysis Team Guide" available at the Department's web site at:

<http://www.dot.ca.gov/hq/oppd/value/>

The facilitator shall be a Certified Value Specialist (CVS) as recognized by the Society of American Value Engineers (SAVE) International, which may be contacted as follows:

SAVE International, 60 Revere Drive, Northbrook, IL 60062  
Telephone 1-847-480-1730, FAX 1-847-480-9282

The Contractor may submit recommendations resulting from a "Value Analysis" workshop for approval by the Engineer as cost reduction incentive proposals in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications.

The costs involved in providing the "Value Analysis" facilitator and workshop site will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost in providing the "Value Analysis" facilitator and workshop site in conformance with the provisions in Section 9-1.03B, "Work Performed by Special Forces or Other Special Services," of the Standard Specifications, and paying to the Contractor one-half of that cost, except no markups will be allowed.

All other costs associated with the "Value Analysis" workshop will be borne separately by the party incurring the costs, such as wages and travel expenses, and no additional compensation will be allowed therefor.

## **5-1.12 DISPUTE REVIEW BOARD**

### **GENERAL**

To assist in the resolution of disputes or potential claims arising out of the work of this project, a Dispute Review Board, hereinafter referred to as the "DRB," shall be established by the Engineer and Contractor cooperatively upon approval of the contract. The DRB is intended to assist the contract administrative claims resolution process as specified in the provisions in Section 9-1.04, "Notice of Potential Claim," and Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications and these special provisions. The DRB shall not serve as a substitute for provisions in the specifications in regard to filing potential claims. The requirements and procedures established in this section shall be a prerequisite to filing a claim, filing for arbitration, or filing for litigation prior or subsequent to project completion.

The DRB shall be utilized when dispute or potential claim resolution at the project level is unsuccessful. The DRB shall function as specified herein until the day of acceptance of the contract, at which time the work of the DRB will cease except for completion of unfinished reports. No DRB dispute meetings shall take place later than 30 days prior to acceptance of contract. After acceptance of contract, disputes or potential claims which have followed the dispute resolution processes of the Standard Specifications and these special provisions, but have not been resolved, shall be stated or restated by the Contractor, in response to the Proposed Final Estimate within the time limits provided in Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications. The State will review those claims in conformance with the provisions in Section 9-1.07B of the Standard Specifications. Following the adherence to and completion of the contractual administrative claims procedure, the Contractor may file for arbitration in conformance with the provisions in Section 9-1.10, "Arbitration," of the Standard Specifications and these special provisions.

Disputes, as used in this section, shall include differences of opinion, properly noticed as provided hereinafter, between the State and Contractor on matters related to the work and other subjects considered by the State or Contractor, or by both, to be of concern to the DRB on this project, except matters relating to Contractor, subcontractor or supplier potential claims not actionable against the Department as specified in these special provisions or quantification of disputes for overhead type expenses or costs. Disputes for overhead type expenses or costs shall conform to the requirements of Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications. Whenever the term "dispute" or "disputes" is used herein, it shall be deemed to include potential claims as well as disputes.

The DRB shall serve as an advisory body to assist in the resolution of disputes between the State and the Contractor, hereinafter referred to as the "parties." The DRB shall consider disputes referred to it, and furnish written reports containing findings and recommendations pertaining to those disputes, to the parties to aid in resolution of the differences between them. DRB findings and recommendations are not binding on the parties.

### **SELECTION PROCESS, DISCLOSURE AND APPOINTMENTS**

The DRB shall consist of one member selected by the State and approved by the Contractor, one member selected by the Contractor and approved by the State, and a third member selected by the first 2 members and approved by both the State and the Contractor. The third member shall act as the DRB Chairperson.

DRB members shall be especially knowledgeable in the type of construction and contract documents potentially anticipated by the contract. DRB members shall discharge their responsibilities impartially as an independent body, considering the facts and circumstances related to the matters under consideration, pertinent provisions of the contract and applicable laws and regulations.

The State and the Contractor shall nominate and approve DRB members in conformance with the terms and conditions of the Dispute Review Board Agreement and these special provisions, within 45 days of the approval of the contract. Each party shall provide written notification to the other of the name of their selected DRB nominee along with the prospective member's complete written disclosure statement.

Disclosure statements shall include a resume of the prospective member's experience and a declaration statement describing past, present, anticipated, and planned relationships, including indirect relationships through the prospective member's primary or full-time employer, to this project and with the parties involved in this construction contract, including but not limited to, relevant subcontractors or suppliers to the parties, parties' principals, or parties' counsel. DRB members shall also include a full disclosure of close professional or personal relationships with all key members of the contract. Objections to nominees must be based on a specific breach or violation of nominee responsibilities or on nominee qualifications under these provisions unless otherwise specified. The Contractor or the State may, on a one-time basis, object to the other's nominee without specifying a reason and this person will not be selected for the DRB. Another person shall then be nominated within 15 days.

The first duty of the State and Contractor selected members of the DRB shall be to select and recommend a prospective third DRB member to the parties for final selection and approval. The first 2 DRB members shall proceed with the selection of the third DRB member immediately upon receiving written notification from the State of their selection, and shall provide their recommendation simultaneously to the parties within 15 days of the notification.

The first 2 DRB members shall select a third DRB member subject to mutual approval of the parties or may mutually

concur on a list of potentially acceptable third DRB members and submit the list to the parties for final selection and approval of the third member. The goal in the selection of the third member is to complement the professional experience of the first 2 members and to provide leadership for the DRB's activities.

The third prospective DRB member shall supply a full disclosure statement to the first 2 DRB members and to the parties prior to appointment.

An impasse shall be considered to have been reached if the parties are unable to approve a third member within 15 days of receipt of the recommendation of the first 2 DRB members, or if the first 2 DRB members are unable to agree upon a recommendation within their 15 day time limit. In the event of an impasse in selection of third DRB member the State and the Contractor shall each propose 3 candidates for the third DRB member position. The parties shall select the candidates proposed under this paragraph from the current list of arbitrators certified by the Public Works Contract Arbitration Committee created by Article 7.2 (commencing with Section 10245) of the State Contract Act. The first 2 DRB members shall then select one of the 6 proposed candidates in a blind draw.

No DRB member shall have prior direct involvement in this contract. No member shall have a financial interest in this contract or the parties thereto, within a period of 6 months prior to award of this contract or during the contract, except as follows:

- A. Compensation for services on this DRB.
- B. Ownership interest in a party or parties, documented by the prospective DRB member, that has been reviewed and determined in writing by the State to be sufficiently insignificant to render the prospective member acceptable to the State.
- C. Service as a member of other Dispute Review Boards on other contracts.
- D. Retirement payments or pensions received from a party that are not tied to, dependent on or affected by the net worth of the party.
- E. The above provisions apply to parties having a financial interest in this contract, including but not limited to contractors, subcontractors, suppliers, consultants, and legal and business services.

The Contractor or the State may reject any of the three DRB members who fail to fully comply at all times with all required employment and financial disclosure conditions of DRB membership as described in the Dispute Review Board Agreement and as specified herein. A copy of the Dispute Review Board Agreement is included in this section.

The Contractor, the State, and the 3 members of the DRB shall complete and adhere to the Dispute Review Board Agreement in administration of this DRB within 15 days of the parties' concurrence in the selection of the third member. No DRB meeting shall take place until the Dispute Review Board Agreement has been signed by all parties. The State authorizes the Engineer to execute and administer the terms of the Agreement. The person(s) designated by the Contractor as authorized to execute contract change orders shall be authorized to execute and administer the terms of this agreement, or to delegate the authority in writing. The operation of the DRB shall be in conformance with the terms of the Dispute Review Board Agreement.

## **COMPENSATION**

The State and the Contractor shall bear the costs and expenses of the DRB equally. Each DRB member shall be compensated at an agreed rate of \$1,200 per day if time spent per meeting, including on-site time plus one hour of travel time, is greater than 4 hours. Each DRB member shall be compensated at an agreed rate of \$700 per day if time spent per meeting, including on-site time plus one hour of travel time, is less than or equal to 4 hours. The agreed rates shall be considered full compensation for on-site time, travel expenses, transportation, lodging, time for travel and incidentals for each day, or portion thereof, that the DRB member is at an authorized DRB meeting. No additional compensation will be made for time spent by DRB members in review and research activities outside the official DRB meetings unless that time, (such as time spent evaluating and preparing recommendations on specific issues presented to the DRB), has been specifically agreed to in advance by the State and Contractor. Time away from the project, which has been specifically agreed to in advance by the parties, will be compensated at an agreed rate of \$125 per hour. The agreed amount of \$125 per hour shall include all incidentals including expenses for telephone, fax, and computer services. Members serving on more than one DRB involving the Department, regardless of the number of meetings per day, shall not be paid more than the all inclusive rate per day or rate per hour for an individual project. The State will provide, at no cost to the Contractor, administrative services such as conference facilities and secretarial services to the DRB. These special provisions and the Dispute Review Board Agreement state the provisions for compensation and expenses of the DRB. DRB members shall be compensated at the same daily and hourly rate. The Contractor shall make direct payments to each DRB member for their participation in authorized meetings and approved hourly rate charges from invoices submitted by each DRB member. The State will reimburse the Contractor for the State's share of the costs. There will be no markups applied to expenses connected with the DRB, either by the DRB members or by the Contractor when requesting payment of the State's share of



DRB expenses. Regardless of the DRB recommendation, neither party shall be entitled to reimbursement of DRB costs from the other party.

### **REPLACEMENT OF DRB MEMBERS**

Service of a DRB member may be terminated at any time with not less than 15 days notice as follows:

- A. The State may terminate service of the State appointed member.
- B. The Contractor may terminate service of the Contractor appointed member.
- C. Upon the written recommendation of the State and Contractor appointed members for the removal of the third member.
- D. Upon resignation of a member.
- E. The State or Contractor may terminate the service of any member who fails to fully comply with all required employment and financial disclosure conditions of DRB membership

When a member of the DRB is replaced, the replacement member shall be appointed in the same manner as the replaced member was appointed. The appointment of a replacement DRB member will begin promptly upon determination of the need for replacement and shall be completed within 15 days. Changes in either of the DRB members chosen by the two parties will not require re-selection of the third member, unless both parties agree to such re-selection in writing. The Dispute Review Board Agreement shall be amended to reflect the change of a DRB member.

### **OPERATION**

The following procedure shall be used for dispute resolution:

- A. If the Contractor objects to any decision, act or order of the Engineer, the Contractor shall give written notice of potential claim in conformance with the provisions in Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications and these special provisions, including the provision of applicable cost documentation; or file written protests or notices in conformance with the provisions in the Standard Specifications and these special provisions.
- B. The Engineer will respond, in writing, to the Contractor's written supplemental notice of potential claim within 20 days of receipt of the notice.
- C. Within 15 days after receipt of the Engineer's written response, the Contractor shall, if the Contractor still objects, file a written reply with the Engineer, stating clearly and in detail the basis of the objection.
- D. Following an objection to the Engineer's written response, the Contractor shall refer the dispute to the DRB if the Contractor wishes to further pursue the objection to the Engineer's decision. The Contractor shall make the referral in writing to the DRB, simultaneously copied to the State, within 21 days after receipt of the written response from the Engineer. The written dispute referral shall describe the disputed matter in individual discrete segments so that it will be clear to both parties and the DRB what discrete elements of the dispute have been resolved, and which remain unresolved, and shall include an estimate of the cost of the affected work and impacts, if any, on project completion.
- E. By failing to submit the written notice of referral to the DRB, within 21 days after receipt of the Engineer's written response to the supplemental notice of potential claim, the Contractor waives future claims and arbitration on the matter in contention.
- F. The Contractor and the State shall each be afforded an opportunity to be present and to be heard by the DRB, and to offer evidence. Either party furnishing written evidence or documentation to the DRB must furnish copies of such information to the other party a minimum of 15 days prior to the date the DRB is scheduled to convene the meeting for the dispute. Either party shall produce such additional evidence as the DRB may deem necessary to reach an understanding and a determination of the dispute. The party furnishing additional evidence shall furnish copies of such additional evidence to the other party at the same time the evidence is provided to the DRB. The DRB shall not consider evidence not furnished in conformance with the terms specified herein.
- G. Upon receipt by the DRB of a written referral of a dispute, the DRB shall convene to review and consider the dispute. The dispute meeting shall be held no earlier than 30 days and no later than 60 days after receipt of the written referral unless otherwise agreed to by all parties. The DRB shall determine the time and location of the DRB dispute meeting, with due consideration for the needs and preferences of the parties while recognizing the paramount importance of a timely hearing of the dispute.
- H. There shall be no participation of either party's attorneys at DRB dispute meetings.
- I. There shall be no participation of persons who are not directly involved in the contract or who do not have direct knowledge of the dispute, including but not limited to consultants, except for expert testimony allowed at the discretion of the DRB and with approval prior to the dispute meeting by both parties.

- J. The DRB shall furnish a report, containing findings and recommendations as described in the Dispute Review Board Agreement, in writing to both the State and the Contractor. The DRB may request clarifying information of either party within 10 days after the DRB dispute meeting. Requested information shall be submitted to the DRB within 10 days of the DRB request. The DRB shall complete its report, including minority opinion, if any, and submit it to the parties within 30 days of the DRB dispute meeting, except that time extensions may be granted at the request of the DRB with the written concurrence of both parties. The report shall include the facts and circumstances related to the matters under consideration, pertinent provisions of the contract, applicable laws and regulations, and actual costs and time incurred as shown on the Contractor's cost accounting records. The DRB shall make recommendations on the merit of the dispute and, if appropriate, recommend guidelines for determining compensation.
- K. Within 30 days after receiving the DRB's report, both the State and the Contractor shall respond to the DRB in writing signifying that the dispute is either resolved or remains unresolved. Failure to provide the written response within the time specified, or a written rejection of the DRB's recommendation or response to a request for reconsideration presented in the report by either party, shall conclusively indicate that the party(s) failing to respond accepts the DRB recommendation. Immediately after responses have been received from both parties, the DRB shall provide copies of both responses to the parties simultaneously. Either party may request clarification of elements of the DRB's report from the DRB prior to responding to the report. The DRB shall consider any clarification request only if submitted within 10 days of receipt of the DRB's report, and if submitted simultaneously in writing to both the DRB and the other party. Each party may submit only one request for clarification for any individual DRB report. The DRB shall respond, in writing, to requests for clarification within 10 days of receipt of such requests.
- L. The DRB's recommendations, stated in the DRB's reports, are not binding on either party. Either party may seek a reconsideration of a recommendation of the DRB. The DRB shall only grant a reconsideration based upon submission of new evidence and if the request is submitted within the 30-day time limit specified for response to the DRB's written report. Each party may submit only one request for reconsideration regarding an individual DRB recommendation.
- M. If the State and the Contractor are able to resolve their dispute with the aid of the DRB's report, the State and Contractor shall promptly accept and implement the recommendations of the DRB. If the parties cannot agree on compensation within 60 days of the acceptance by both parties of the DRB's recommendation, either party may request the DRB to make a recommendation regarding compensation.
- N. The State or the Contractor shall not call DRB members who served on the DRB for this contract as witnesses in arbitration proceedings which may arise from this contract, and all documents created by the DRB shall be inadmissible as evidence in subsequent arbitration proceedings, except the DRB's final written reports on each issue brought before it.
- O. The State and Contractor shall jointly indemnify and hold harmless the DRB members from and against all claims, damages, losses, and expenses, including but not limited to attorney's fees, arising out of and resulting from the findings and recommendations of the DRB.
- P. The DRB members shall have no claim against the State or the Contractor, or both, from claimed harm arising out of the parties' evaluations of the DRB's report.

#### **DISPUTES INVOLVING SUBCONTRACTOR POTENTIAL CLAIMS**

For purposes of this section, a "subcontractor potential claim" shall include any potential claim by a subcontractor (including also any pass through potential claims by a lower tier subcontractor or supplier) against the Contractor that is actionable by the Contractor against the Department which arises from the work, services, or materials provided or to be provided in connection with the contract. If the Contractor determines to pursue a dispute against the Department that includes a subcontractor potential claim, the dispute shall be processed and resolved in conformance with these special provisions and in conformance with the following:

- A. The Contractor shall identify clearly in submissions pursuant to this section, that portion of the dispute that involves a subcontractor potential claim or potential claims.
- B. The Contractor shall include, as part of its submission pursuant to Step D above, a certification (False Claims Act Certification) by the subcontractor's or supplier's officer, partner, or authorized representative with authority to bind the subcontractor and with direct knowledge of the facts underlying the subcontractor potential claim. The Contractor shall submit a certification that the subcontractor potential claim is acknowledged and forwarded by the Contractor. The form for these certifications is available from the Engineer.
- C. At DRB dispute meetings involving one or more subcontractor potential claims, the Contractor shall require that each subcontractor involved in the dispute have present an authorized representative with actual knowledge of the

facts underlying the subcontractor potential claim to assist in presenting the subcontractor potential claim and to answer questions raised by the DRB members or the Department's representatives.

- D. Failure by the Contractor to declare a subcontractor potential claim on behalf of its subcontractor (including lower tier subcontractors' and suppliers' pass through potential claims) at the time of submission of the Contractor's potential claims, as provided hereunder, shall constitute a release of the State by the Contractor of such subcontractor potential claim.
- E. The Contractor shall include in all subcontracts under this contract that subcontractors and suppliers of any tier (a) agree to submit subcontractor potential claims to the Contractor in a proper form and in sufficient time to allow processing by the Contractor in conformance with the Dispute Review Board resolution specifications; (b) agree to be bound by the terms of the Dispute Review Board provisions to the extent applicable to subcontractor potential claims; (c) agree that, to the extent a subcontractor potential claim is involved, completion of all steps required under these Dispute Review Board special provisions shall be a condition precedent to pursuit by the subcontractor of other remedies permitted by law, including without limitation of a lawsuit against the Contractor; and (d) agree that the existence of a dispute resolution process for disputes involving subcontractor potential claims shall not be deemed to create any claim, right, or cause of action by any subcontractor or supplier against the Department.

Notwithstanding the foregoing, this Dispute Review Board special provision shall not apply to, and the DRB shall not have the authority to consider, subcontractor potential claims between the subcontractor(s) or supplier(s) and the Contractor that are not actionable by the Contractor against the Department.

### **RETENTION**

Failure of the Contractor to nominate and approve DRB members in conformance with the terms and conditions of the Dispute Review Board Agreement and these special provisions shall result in the retention of 25 percent of the estimated value of all work performed during each estimate period in which the Contractor fails to comply with the requirements of this section as determined by the Engineer. DRB retentions will be released for payment on the next monthly estimate for partial payment following the date that the Contractor has nominated and approved DRB members and no interest will be due the Contractor.

### **DISPUTE REVIEW BOARD AGREEMENT**

A copy of the "Dispute Review Board Agreement" to be executed by the Contractor, State and the 3 DRB members after approval of the contract follows:

**DISPUTE REVIEW BOARD AGREEMENT**

\_\_\_\_\_  
(Contract Identification)

Contract No. \_\_\_\_\_

**THIS DISPUTE REVIEW BOARD AGREEMENT, hereinafter called "AGREEMENT"**, made and entered into this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_, between the State of California, acting through the California Department of Transportation and the Director of Transportation, hereinafter called the "STATE," \_\_\_\_\_ hereinafter called the "CONTRACTOR," and the Dispute Review Board, hereinafter called the "DRB" consisting of the following members:

\_\_\_\_\_,  
(Contractor Appointee)

\_\_\_\_\_,  
(State Appointee)

and \_\_\_\_\_  
(Third Person)

WITNESSETH, that

WHEREAS, the STATE and the CONTRACTOR, hereinafter called the "parties," are now engaged in the construction on the State Highway project referenced above; and

WHEREAS, the special provisions for the above referenced contract provides for the establishment and operation of the DRB to assist in resolving disputes; and

WHEREAS, the DRB is composed of three members, one selected by the STATE, one selected by the CONTRACTOR, and the third member selected by the other two members and approved by the parties;

NOW THEREFORE, in consideration of the terms, conditions, covenants, and performance contained herein, or attached and incorporated and made a part hereof, the STATE, the CONTRACTOR, and the DRB members hereto agree as follows:

**SECTION I DESCRIPTION OF WORK**

To assist in the resolution of disputes between the parties, the contract provides for the establishment and the operation of the DRB. The intent of the DRB is to fairly and impartially consider disputes placed before it and provide written recommendations for resolution of these disputes to both parties. The members of this DRB shall perform the services necessary to participate in the DRB's actions as designated in Section II, Scope of Work.

**SECTION II SCOPE OF WORK**

The scope of work of the DRB includes, but is not limited to, the following:

**A. OBJECTIVE**

The principal objective of the DRB is to assist in the timely resolution of disputes between the parties arising from performance of this contract. It is not intended for either party to default on their normal responsibility to amicably and fairly settle their differences by indiscriminately assigning them to the DRB. It is intended that the mere existence of the DRB will encourage the parties to resolve disputes without resorting to this review procedure. But when a dispute that is serious enough to warrant the DRB's review does develop, the process for prompt and efficient action will be in place.

## **B. PROCEDURES**

The DRB shall render written reports on disputes between the parties arising from the construction contract. Prior to consideration of a dispute, the DRB shall establish rules and regulations that will govern the conduct of its business and reporting procedures in conformance with the requirements of the contract and the terms of this AGREEMENT. DRB recommendations, resulting from its consideration of a dispute, shall be furnished in writing to both parties. The recommendations shall be based on facts and circumstances involved in the dispute, pertinent contract provisions, applicable laws and regulations. The recommendations shall find one responsible party in a dispute; shared or "jury" determinations shall not be rendered. The DRB shall make recommendations on the merit of the dispute, and if appropriate, recommend guidelines for determining compensation. If the parties cannot agree on compensation within 60 days of the acceptance by both parties of the DRB's recommendation, either party may request the DRB to make a recommendation regarding compensation.

The DRB shall refrain from officially giving advice or consulting services to anyone involved in the contract. The individual members shall act in a completely independent manner and while serving as members of the DRB shall have no consulting business connections with either party or its principals or attorneys or other affiliates (subcontractors, suppliers, etc.) who have a beneficial interest in the contract.

During scheduled meetings of the DRB as well as during dispute meetings, DRB members shall refrain from expressing opinions on the merits of statements on matters under dispute or potential dispute. Opinions of DRB members expressed in private sessions shall be kept strictly confidential. Individual DRB members shall not meet with, or discuss contract issues with individual parties, except as directed by the DRB Chairperson. Such discussions or meetings shall be disclosed to both parties. Other discussions regarding the project between the DRB members and the parties shall be in the presence of all three members and both parties. Individual DRB members shall not undertake independent investigations of any kind pertaining to disputes or potential disputes, except with the knowledge of both parties and as expressly directed by the DRB Chairperson.

## **C. CONSTRUCTION SITE VISITS, PROGRESS MEETINGS AND FIELD INSPECTIONS**

The DRB members shall visit the project site and meet with representatives of the parties to keep abreast of construction activities and to develop familiarity with the work in progress. Scheduled progress meetings shall be held at or near the project site. The DRB shall meet at least once at the start of the project, and at least once every 4 months thereafter. The frequency, exact time, and duration of additional site visits and progress meetings shall be as recommended by the DRB and approved by the parties consistent with the construction activities or matters under consideration and dispute. Each meeting shall consist of a round table discussion and a field inspection of the work being performed on the contract, if necessary. Each meeting shall be attended by representatives of both parties. The agenda shall generally be as follows:

1. Meeting opened by the DRB Chairperson.
2. Remarks by the STATE's representative.
3. A description by the CONTRACTOR's representative of work accomplished since the last meeting; the current schedule status of the work; and a forecast for the coming period.
4. An outline by the CONTRACTOR's representative of potential problems and a description of proposed solutions.
5. An outline by the STATE's representative of the status of the work as the STATE views it.
6. A brief description by the CONTRACTOR's or STATE's representative of potential claims or disputes which have surfaced since the last meeting.
7. A summary by the STATE's representative, the CONTRACTOR's representative, or the DRB of the status of past disputes and potential claims.

The STATE's representative will prepare minutes of all progress meetings and circulate them for revision and approval by all concerned within 10 days of the meeting.

The field inspection shall cover all active segments of the work, the DRB being accompanied by both parties' representatives. The field inspection may be waived upon mutual agreement of the parties.

## **D. DRB CONSIDERATION AND HANDLING OF DISPUTES**

Upon receipt by the DRB of a written referral of a dispute, the DRB shall convene to review and consider the dispute. The dispute meeting shall be held no earlier than 30 days and no later than 60 days after receipt of the written referral, unless otherwise agreed to by all parties. The DRB shall determine the time and location of DRB dispute meetings, with due consideration for the needs and preferences of the parties while recognizing the paramount importance of speedy resolution of issues. No dispute meetings shall take place later than 30 days prior to acceptance of contract.

Normally, dispute meetings shall be conducted at or near the project site. However, any location that would be more convenient and still provide required facilities and access to necessary documentation shall be satisfactory.

Both parties shall be given the opportunity to present their evidence at these dispute meetings. It is expressly understood that the DRB members are to act impartially and independently in the consideration of the contract provisions, applicable laws and regulations, and the facts and conditions surrounding any dispute presented by either party, and that the recommendations concerning any such dispute are advisory and nonbinding on the parties.

The DRB may request that written documentation and arguments from both parties be sent to each DRB member, through the DRB Chairperson, for review before the dispute meeting begins. A party furnishing written documentation to the DRB shall furnish copies of such information to the other party at the same time that such information is supplied to the DRB.

DRB dispute meetings shall be informal. There shall be no testimony under oath or cross-examination. There shall be no reporting of the procedures by a shorthand reporter or by electronic means. Documents and verbal statements shall be received by the DRB in conformance with acceptance standards established by the DRB. These standards need not comply with prescribed legal laws of evidence.

The third DRB member shall act as Chairperson for dispute meetings and all other DRB activities. The parties shall have a representative at all dispute meetings. Failure to attend a duly noticed dispute meeting by either of the parties shall be conclusively considered by the DRB as indication that the non-attending party considers written submittals as their entire and complete argument. The claimant shall discuss the dispute, followed by the other party. Each party shall then be allowed one or more rebuttals until all aspects of the dispute are thoroughly covered. DRB members shall ask questions, seek clarification, and request further data from either of the parties as may be necessary to assist in making a fully informed recommendation. The DRB may request from either party documents or information that would assist the DRB in making its findings and recommendations including, but not limited to, documents used by the CONTRACTOR in preparing the bid for the project. A refusal by a party to provide information requested by the DRB may be considered by the DRB as an indication that the requested material would tend to disprove that party's position. In large or complex cases, additional dispute meetings may be necessary in order to consider all the evidence presented by both parties. All involved parties shall maintain the confidentiality of all documents and information, as provided in this AGREEMENT.

During dispute meetings, no DRB member shall express an opinion concerning the merit of any facet of the case. DRB deliberations shall be conducted in private, with interim individual views kept strictly confidential.

After dispute meetings are concluded, the DRB shall meet in private and reach a conclusion supported by 2 or more members. Private sessions of the DRB may be held at a location other than the job site or by electronic conferencing as deemed appropriate, in order to expedite the process.

The DRB's findings and recommendations, along with discussion of reasons therefor, shall then be submitted as a written report to both parties. Recommendations shall be based on the pertinent contract provisions, applicable laws and regulations, and facts and circumstances related to the dispute. The report shall be thorough in discussing the facts considered, the contract language, law or regulation viewed by the DRB as pertinent to the issues, and the DRB's interpretation and philosophy in arriving at its conclusions and recommendations. The DRB's report shall stand on its own, without attachments or appendices. The DRB Chairperson shall furnish a copy of the written recommendation report to the DRB Coordinator, Division of Construction, MS 44, P.O. Box 942874, Sacramento, CA 94274.

With prior written approval of both parties, the DRB may obtain technical services necessary to adequately review the disputes presented, including audit, geotechnical, schedule analysis and other services. The parties' technical staff may supply those services as appropriate. The cost of technical services, as agreed to by the parties, shall be borne equally by the 2 parties as specified in an approved contract change order. The CONTRACTOR will not be entitled to markups for the payments made for these services.

The DRB shall resist submittal of incremental portions of information by either party, in the interest of making a fully informed decision and recommendation.

The DRB shall make every effort to reach a unanimous decision. If this proves impossible, the dissenting member shall prepare a minority opinion, which shall be included in the DRB's report.

Although both parties should place weight upon the DRB's recommendations, they are not binding. Either party may appeal a recommendation to the DRB for reconsideration. However, reconsideration shall only be allowed when there is new evidence to present, and the DRB shall accept only one appeal from each party pertaining to an individual DRB recommendation. The DRB shall hear appeals in conformance with the terms described in the Section entitled "Dispute Review Board" in the special provisions.

#### **E. DRB MEMBER REPLACEMENT**

Should the need arise to appoint a replacement DRB member, the replacement DRB member shall be appointed in the same manner as the original DRB members were appointed. The selection of a replacement DRB member shall begin promptly upon notification of the necessity for a replacement and shall be completed within 15 days. This AGREEMENT shall be amended to indicate change in DRB membership.

### **SECTION III CONTRACTOR RESPONSIBILITIES**

The CONTRACTOR shall furnish to each DRB member one copy of pertinent documents that are or may become necessary for the DRB to perform their function. Pertinent documents are written notices of potential claim, responses to those notices, drawings or sketches, calculations, procedures, schedules, estimates, or other documents which are used in the performance of the work or in justifying or substantiating the CONTRACTOR's position. The CONTRACTOR shall also furnish a copy of such pertinent documents to the STATE, in conformance with the terms outlined in the special provisions.

### **SECTION IV STATE RESPONSIBILITIES**

The STATE will furnish the following services and items:

#### **A. CONTRACT RELATED DOCUMENTS**

The STATE will furnish to each DRB member one copy of Notice to Contractors and Special Provisions, Proposal and Contract, Plans, Standard Specifications, and Standard Plans, change orders, written instructions issued by the STATE to the CONTRACTOR, or other documents pertinent to any dispute that has been referred to the DRB and necessary for the DRB to perform its function.

#### **B. COORDINATION AND SERVICES**

The STATE, through the Engineer, will, in cooperation with the CONTRACTOR, coordinate the operations of the DRB. The Engineer will arrange or provide conference facilities at or near the project site and provide secretarial and copying services to the DRB without charge to the CONTRACTOR.

### **SECTION V TIME FOR BEGINNING AND COMPLETION**

Once established, the DRB shall be in operation until the day of acceptance of the contract. The DRB members shall not begin work under the terms of this AGREEMENT until authorized in writing by the STATE.

### **SECTION VI PAYMENT**

#### **A. ALL INCLUSIVE RATE PAYMENT**

The STATE and the CONTRACTOR shall bear the costs and expenses of the DRB equally. Each DRB member shall be compensated at an agreed rate of \$1,200 per day if time spent per meeting, including on-site time plus one hour of travel time, is greater than 4 hours. Each DRB member shall be compensated at an agreed rate of \$700 per day if time spent per meeting, including on-site time plus one hour of travel time, is less than or equal to 4 hours. The agreed rates shall be considered full compensation for on-site time, travel expenses, transportation, lodging, time for travel and incidentals for each day, or portion thereof, that the DRB member is at an authorized DRB meeting. No additional compensation will be made for time spent by DRB members in review and research activities outside the official DRB meetings unless that time has been specifically agreed to in advance by the STATE and CONTRACTOR. Time away from the project that has been specifically agreed to in advance by the parties will be compensated at an agreed rate of \$125 per hour. The agreed amount of \$125 per hour shall include all incidentals including expenses for telephone, fax, and computer services. Members serving on more than one DRB involving the State, regardless of the number of meetings per day, shall not be paid more than the all inclusive rate per day or rate per hour for an individual project. The STATE will provide, at no cost to the CONTRACTOR, administrative services such as conference facilities and secretarial services to the DRB.

#### **B. PAYMENTS**

DRB members shall be compensated at the same rate. The CONTRACTOR shall make direct payments to each DRB member for their participation in authorized meetings and approved hourly rate charges from invoices submitted by each DRB member. The STATE will reimburse the CONTRACTOR for its share of the costs of the DRB.

The DRB members may submit invoices to the CONTRACTOR for partial payment for work performed and services rendered for their participation in authorized meetings not more often than once per month during the progress of the work. The invoices shall be in a format approved by the parties and accompanied by a general description of activities performed during that billing period. Payment for hourly fees, at the agreed rate, shall not be paid to a DRB member until the amount and extent of those fees are approved by the STATE and CONTRACTOR.

Invoices shall be accompanied by original supporting documents, which the CONTRACTOR shall include with the extra work billing when submitting for reimbursement of the STATE's share of cost from the STATE. The CONTRACTOR will be reimbursed for one-half of approved costs of the DRB. No markups will be added to the CONTRACTOR's payment.

#### **C. INSPECTION OF COSTS RECORDS**

The DRB members and the CONTRACTOR shall keep available for inspection by representatives of the STATE and the

United States, for a period of 3 years after final payment, the cost records and accounts pertaining to this AGREEMENT. If any litigation, claim, or audit arising out of, in connection with, or related to this contract is initiated before the expiration of the 3-year period, the cost records and accounts shall be retained until such litigation, claim, or audit involving the records is completed.

#### **SECTION VII ASSIGNMENT OF TASKS OF WORK**

The DRB members shall not assign the work of this AGREEMENT.

#### **SECTION VIII TERMINATION OF DRB MEMBERS**

DRB members may resign from the DRB by providing not less than 15 days written notice of the resignation to the STATE and CONTRACTOR. DRB members may be terminated by their original appointing power or by either party, for failing to fully comply at all times with all required employment and financial disclosure conditions of DRB membership in conformance with the terms of the contract.

#### **SECTION IX LEGAL RELATIONS**

The parties hereto mutually understand and agree that the DRB member in the performance of duties on the DRB, is acting in the capacity of an independent agent and not as an employee of either party.

No party to this AGREEMENT shall bear a greater responsibility for damages or personal injury than is normally provided by Federal or State of California Law.

Notwithstanding the provisions of this contract that require the CONTRACTOR to indemnify and hold harmless the STATE, the parties shall jointly indemnify and hold harmless the DRB members from and against all claims, damages, losses, and expenses, including but not limited to attorney's fees, arising out of and resulting from the findings and recommendations of the DRB.

#### **SECTION X CONFIDENTIALITY**

The parties hereto mutually understand and agree that all documents and records provided by the parties in reference to issues brought before the DRB, which documents and records are marked "Confidential - for use by the DRB only," shall be kept in confidence and used only for the purpose of resolution of subject disputes, and for assisting in development of DRB findings and recommendations; that such documents and records will not be utilized or revealed to others, except to officials of the parties who are authorized to act on the subject disputes, for any purposes, during the life of the DRB. Upon termination of this AGREEMENT, said confidential documents and records, and all copies thereof, shall be returned to the parties who furnished them to the DRB. However, the parties understand that such documents shall be subsequently discoverable and admissible in court or arbitration proceedings unless a protective order has been obtained by the party seeking further confidentiality.

#### **SECTION XI DISPUTES**

Disputes between the parties hereto, including disputes between the DRB members and either party or both parties, arising out of the work or other terms of this AGREEMENT, which cannot be resolved by negotiation and mutual concurrence between the parties, or through the administrative process provided in the contract, shall be resolved by arbitration as provided in Section 9-1.10, "Arbitration," of the Standard Specifications.

#### **SECTION XII VENUE, APPLICABLE LAW, AND PERSONAL JURISDICTION**

In the event that any party, including an individual member of the DRB, deems it necessary to institute arbitration proceedings to enforce any right or obligation under this AGREEMENT, the parties hereto agree that such action shall be initiated in the Office of Administrative Hearings of the State of California. The parties hereto agree that all questions shall be resolved by arbitration by application of California law and that the parties to such arbitration shall have the right of appeal from such decisions to the Superior Court in conformance with the laws of the State of California. Venue for the arbitration shall be Sacramento or any other location as agreed to by the parties.

#### **SECTION XIII FEDERAL REVIEW AND REQUIREMENTS**

On Federal-Aid contracts, the Federal Highway Administration shall have the right to review the work of the DRB in progress, except for private meetings or deliberations of the DRB.

Other Federal requirements in this agreement shall only apply to Federal-Aid contracts.

#### **SECTION XIV CERTIFICATION OF THE CONTRACTOR, THE DRB MEMBERS, AND THE STATE**

IN WITNESS WHEREOF, the parties hereto have executed this AGREEMENT as of the day and year first above written.



DRB MEMBER

By: \_\_\_\_\_

Title: \_\_\_\_\_

DRB MEMBER

By: \_\_\_\_\_

Title : \_\_\_\_\_

DRB MEMBER

By : \_\_\_\_\_

Title : \_\_\_\_\_

CONTRACTOR

By: \_\_\_\_\_

Title: \_\_\_\_\_

CALIFORNIA STATE DEPARTMENT  
OF TRANSPORTATION

By: \_\_\_\_\_

Title: \_\_\_\_\_

- 
- United States Department of Transportation (USDOT)
- United States Environmental Protection Agency (USEPA)
- California Environmental Protection Agency (CAL-EPA):
- California Division of Occupational Safety and Health Administration (CAL-OSHA)
- Placer County Department of Health and Human Services

#### **Permits and licenses**

The Contractor shall procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work. The California Environmental Quality Act (CEQA) of 1970 (Chapter 1433, States. 1970), as amended, may be applicable to permits, licenses and authorizations which the Contractor shall obtain from all agencies in connection with performing the work of the contract. The Contractor shall comply with the provisions of said statutes in obtaining such permits, licenses and other authorizations.

#### **Health, safety and work plan**

The Contractor shall prepare a Health, Safety and Work Plan for site personnel. The Health, Safety and Work Plan shall include mandatory personal protective equipment, training, equipment decontamination procedures, spill plan, site clean up procedures, and physical barrier requirements in accordance with California Code of Regulations (CCR), Title 8. The Health, Safety and Work Plan shall include a description of the order of work, material handling, permit requirements, material segregation, stockpile locations, sampling protocols, transportation and disposal sites for petroleum hydrocarbon materials. The Health, Safety and Work Plan shall be submitted for review and acceptance by the Engineer at least 15 working days prior to beginning any excavation work. Prior to submittal, the Contractor shall have the Health, Safety, and Work Plan approved by a Certified Industrial Hygienist. If the plan is determined to be unacceptable, it will be returned, within 10 working days of submittal, to the Contractor for revision. The Contractor shall submit the revised plan to the Engineer at least 2 days prior to commencing excavation work. No work shall proceed until the

plan is accepted by the Engineer. Prior to submittal, the Contractor shall have the Health, Safety and Work Plan for all excavation work approved by a California Certified Industrial Hygienist and a California Registered Civil Engineer. Non-reusable protective equipment, once used by any personnel, including State personnel, shall be collected and disposed of at an appropriate disposal site by the Contractor. Full compensation for preparation of Health, Safety, and Work Plan shall be considered as included in the contract price paid for Structure Excavation (Tunnel) (Type DH) and no additional compensation will be allowed therefor.

#### **Safety training**

Prior to performing any excavation work, all personnel working on the project, including State Personnel, shall complete

required training specified in the Contractor's compliance program covering the potential hazards as identified. Any required training shall be provided by the Contractor who shall provide a certification of the completion of the Safety Training Program for all personnel. Personal protective equipment required by the Contractor's Health, Safety and Work for personnel working on the project will also be supplied to State personnel by the Contractor. The number of State personnel requiring the above mentioned safety training program and personal protective equipment will be three (3). Full compensation for safety training shall be considered as included in the contract price paid for Structure Excavation (Tunnel) (Type DH) and no additional compensation will be allowed therefor.

#### **Segregation of designated waste**

All excavated material between STA 'T' 4+35 and 'T' 4+60 shall be stockpiled in a fenced area on two layers of 10-mil thick (minimum) black polyethylene. Segregation of excavated material into two distinct stockpiles may be required in order to separate contaminated and non-contaminated material. The Engineer or designated representative shall provide direction regarding the placement of excavated material into either the contaminated or non-contaminated stockpiles. A perimeter berm for the stockpiles shall be constructed by wrapping the edges of the plastic over hay bales, or equivalent, to prevent contaminated water runoff and infiltration. The stockpiles shall be covered with one layer of 10-mil (minimum) black polyethylene at all times. The plastic shall be sufficiently weighted with sandbags to prevent wind damage to the plastic. The Contractor shall be responsible for protecting the stockpiles until such time material is relinquished to Chevron as mentioned below. Full compensation for segregation of designated waste material shall be considered as included in the contract price paid for Structure Excavation (Tunnel) (Type DH) and no additional compensation will be allowed therefor.

#### **Sampling and analysis requirements**

All excavated material from the contamination site will be tested by Chevron with results provided within 5 working days. The Contractor shall collect split samples of all soil testing performed by Chevron and provide results to the Engineer within 5 working days. At a minimum, a split sample shall be collected for every 150 cubic meters of excavated soil from the contamination site.

If any of this material is found through testing to contain concentrations above 1.0 mg/kg of either TPH-diesel or TPH-gasoline; or concentrations above 5.0 µg/kg of either Benzene, Toluene, Ethylbenzene, or Xylene (BTEX); or concentrations above 5.0 µg/kg of MTBE, the material shall be considered a designated waste and shall immediately be relinquished to Chevron.

Chevron will transport and dispose of all designated waste material within 30 days after receipt of sample results. The material shall become the property of the Contractor if testing shows contaminant concentrations below those mentioned above. The Contractor's sampling and testing analysis shall be performed using sampling and testing analysis procedures required by the regulatory agencies in the locality of the job. The laboratory used shall be certified by the California Department of Health Services for the required analyses.

Samples shall be analyzed for Total Petroleum Hydrocarbons as Diesel (TPH-D) and Gasoline (TPH-G) by EPA Test Method 8015M and BTEX by EPA Method 8021, and MTBE by EPA Test Method 8260B. Analytical reporting limits shall not exceed 1.0 mg/kg for TPH-diesel or TPH-gasoline or 5.0 µg/kg for BTEX and MTBE.

A letter report shall be prepared and signed by a California Registered Civil Engineer or Geologist and include, at a minimum, the volume of removed contaminated soil, sampling procedures, and laboratory analytical results.

#### **Payment**

The contract price paid per cubic meter for Structure Excavation (Tunnel) (Type DH) shall include full compensation for furnishing all labor, training, materials, tools, equipment, and incidentals, and for doing all the work involved in excavation within the contamination area including stockpiling, sorting the material into its' appropriate classification, sampling, testing, permitting, and providing a letter report as specified in these special provisions, and as directed by the Engineer.

#### **5-1.13 FORCE ACCOUNT PAYMENT**

The second, third and fourth paragraphs of Section 9-1.03A, "Work Performed by Contractor," in the Standard Specifications, shall not apply.

Attention is directed to "Time-Related Overhead" of these special provisions.

To the total of the direct costs for work performed on a force account basis, computed as provided in Sections 9-1.03A(1), "Labor," 9-1.03A(2), "Materials," and 9-1.03A(3), "Equipment Rental," of the Standard Specifications, there will be added the following markups:

Cost	Percent Markup
Labor	28
Materials	10

Equipment Rental	10
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The above markups shall be applied to work performed on a force account basis, regardless of whether the work revises the current contract completion date.

The above markups, together with payments made for time-related overhead pursuant to "Time-Related Overhead" of these special provisions, shall constitute full compensation for all overhead costs for work performed on a force account basis. These overhead costs shall be deemed to include all items of expense not specifically designated as cost or equipment rental in conformance with the provisions in Sections 9-1.03A(1), "Labor," 9-1.03A(2), "Materials," and 9-1.03A(3), "Equipment Rental," of the Standard Specifications. The total payment made as provided above and in the first paragraph of Section 9-1.03A, "Work Performed by Contractor," of the Standard Specifications shall be deemed to be the actual cost of the work performed on a force account basis, and shall constitute full compensation therefor.

Full compensation for overhead costs for work performed on a force account basis, and for which no adjustment is made to the quantity for time-related overhead conforming to the provisions in "Time-Related Overhead" of these special provisions, shall be considered as included in the markups specified above, and no additional compensation will be allowed therefor.

When extra work to be paid for on a force account basis is performed by a subcontractor, approved in conformance with the provisions in Section 8-1.01, "Subcontracting," of the Standard Specifications, an additional markup of 7 percent will be added to the total cost of that extra work including all markups specified in this section "Force Account Payment". The additional 7 percent markup shall reimburse the Contractor for additional administrative costs, and no other additional payment will be made by reason of performance of the extra work by a subcontractor.

#### 5-1.14 RESPONSIBILITY TO OTHER ENTITIES

The Contractor shall be responsible for any liability imposed by law and for injuries to or death of any person including, but not limited to, workers and the public or damage to property, and shall indemnify and save harmless any county, city or district, its officers and employees connected with the work, within the limits of which county, city or district the work is being performed, all in the same manner and to the same extent conforming to the provisions in Section 7-1.12, "Indemnification and Insurance," of the Standard Specifications, for the protection of the State of California and all officers and employees thereof connected with the work.

#### 5-1.15 GRADING PERMIT

Attention is directed to the provisions in Section 7-1.04, "Permits and Licenses," of the Standard Specifications and these special provisions.

The Contractor shall be responsible for obtaining no-fee grading and encroachment permits prior to beginning any work within the Roseville city limits. Grading and encroachment permit forms may be obtained from the cities permit office, at 311 Vernon Street, Roseville, California, 95678.

#### 5-1.16 COMPENSATION ADJUSTMENTS FOR PRICE INDEX FLUCTUATIONS

The provisions of this section shall apply only to the following contract items:

ITEM CODE	ITEM
390155	ASPHALT CONCRETE (TYPE A)
390165	ASPHALT CONCRETE (OPEN GRADED)
391031	PAVING ASPHALT (BINDER-PAVEMENT REINFORCING FABRIC)

The compensation payable for asphalt concrete and paving asphalt (binder-pavement reinforcing fabric) will be increased or decreased in conformance with the provisions of this section for paving asphalt price fluctuations exceeding 10 percent (Iu/Ib is greater than 1.10 or less than 0.90) which occur during performance of the work.

The adjustment in compensation will be determined in conformance with the following formulae when the item of asphalt concrete or paving asphalt (binder-pavement reinforcing fabric) (or both) is included in a monthly estimate:

- A. Total monthly adjustment = AQ
- B. For an increase in paving asphalt price index exceeding 10 percent:

$$A = 0.90 (1.1023) (Iu/Ib - 1.10) Ib$$

- C. For a decrease in paving asphalt price index exceeding 10 percent:

$$A = 0.90 (1.1023) (I_u/I_b - 0.90) I_b$$

D. Where:

A = Adjustment in dollars per tonne of paving asphalt used to produce asphalt concrete and used as a binder for pavement reinforcing fabric rounded to the nearest \$0.01.

I<sub>u</sub> = The California Statewide Paving Asphalt Price Index which is in effect on the first business day of the month within the pay period in which the quantity subject to adjustment was included in the estimate.

I<sub>b</sub> = The California Statewide Paving Asphalt Price Index for the month in which the bid opening for the project occurred.

Q = Quantity in tonnes of paving asphalt that was used as a binder for pavement reinforcing fabric plus the quantity of paving asphalt that was used in producing the quantity of asphalt concrete shown under "This Estimate" on the monthly estimate using the amount of asphalt determined by the Engineer.

The adjustment in compensation will also be subject to the following:

- A. The compensation adjustments provided herein will be shown separately on payment estimates. The Contractor shall be liable to the State for decreased compensation adjustments and the Department may deduct the amount thereof from any moneys due or that may become due the Contractor.
- B. Compensation adjustments made under this section will be taken into account in making adjustments in conformance with the provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications.
- C. In the event of an overrun of contract time, adjustment in compensation for paving asphalt included in estimates during the overrun period will be determined using the California Statewide Paving Asphalt Price Index in effect on the first business day of the month within the pay period in which the overrun began.

The California Statewide Paving Asphalt Price Index is determined each month on the first business day of the month by the Department using the median of posted prices in effect as posted by Chevron, Mobil, and Unocal for the Buena Vista, Huntington Beach, Kern River, Long Beach, Midway Sunset, and Wilmington fields.

In the event that the companies discontinue posting their prices for a field, the Department will determine an index from the remaining posted prices. The Department reserves the right to include in the index determination the posted prices of additional fields.

#### **5-1.17 AREAS FOR CONTRACTOR'S USE**

Attention is directed to the provisions in Section 7-1.19, "Rights in Land and Improvements," of the Standard Specifications and these special provisions.

The highway right of way shall be used only for purposes that are necessary to perform the required work. The Contractor shall not occupy the right of way, or allow others to occupy the right of way, for purposes which are not necessary to perform the required work.

No State-owned parcels adjacent to the right of way are available for the exclusive use of the Contractor within the contract limits. The Contractor shall secure, at the Contractor's own expense, areas required for plant sites, storage of equipment or materials, or for other purposes.

No area is available within the contract limits for the exclusive use of the Contractor. However, temporary storage of equipment and materials on State property may be arranged with the Engineer, subject to the prior demands of State maintenance forces and to other contract requirements. Use of the Contractor's work areas and other State-owned property shall be at the Contractor's own risk, and the State shall not be held liable for damage to or loss of materials or equipment located within such areas.

#### **5-1.18 PAYMENTS**

Attention is directed to Sections 9-1.06, "Partial Payments," and 9-1.07, "Payment After Acceptance," of the Standard Specifications and these special provisions.

For the purpose of making partial payments pursuant to Section 9-1.06, "Partial Payments," of the Standard Specifications, the amount set forth for the contract items of work hereinafter listed shall be deemed to be the maximum value of the contract item of work which will be recognized for progress payment purposes:

A. Clearing and Grubbing	\$70,000.00
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B. Progress Schedule (Critical Path Method)	\$10,000.00
C. Lead Compliance Plan	\$10,000.00
D. Prepare Storm Water Pollution Prevention Plan	\$10,000.00

After acceptance of the contract pursuant to the provisions in Section 7-1.17, "Acceptance of Contract," of the Standard Specifications, the amount, if any, payable for a contract item of work in excess of the maximum value for progress payment purposes hereinabove listed for the item, will be included for payment in the first estimate made after acceptance of the contract.

In determining the partial payments to be made to the Contractor, only the following listed materials will be considered for inclusion in the payment as materials furnished but not incorporated in the work:

- A. Pavement Reinforcing Fabric
- B. Piling
- C. Spherical Bearings
- E. Joint Assemblies
- F. Bar Reinforcing Steel
- G. Metal Sign Structures
- G. Culvert Pipe and Appurtenances
- H. Underdrain Pipe
- I. Plastic Pipe
- J. Drainage Pumping Equipment
- K. Pumping Plant Electrical Equipment
- L. Tunnel Electrical Equipment
- M. Tunnel Exhaust System Equipment
- N. Standby Generator
- O. Miscellaneous Iron and Steel
- P. Miscellaneous Metal
- Q. Fences
- R. Railings
- S. Crash Cushions
- T. Pavement Markers
- U. Luminaires
- V. Signal and Lighting Standards
- W. Signal Head and Mounting Brackets

#### **5-1.19 SOUND CONTROL REQUIREMENTS**

Sound control shall conform to the provisions in Section 7-1.01I, "Sound Control Requirements," of the Standard Specifications and these special provisions.

The noise level from the Contractor's operations, between the hours of 9:00 p.m. and 6:00 a.m., shall not exceed 86 dBa at a distance of 15 m. This requirement shall not relieve the Contractor from responsibility for complying with local ordinances regulating noise level.

The noise level requirement shall apply to the equipment on the job or related to the job, including but not limited to trucks, transit mixers or transient equipment that may or may not be owned by the Contractor. The use of loud sound signals shall be avoided in favor of light warnings except those required by safety laws for the protection of personnel.

Full compensation for conforming to the requirements of this section shall be considered as included in the prices paid for the various contract items of work involved and no additional compensation will be allowed therefor.

#### **5-1.20 FIRE PLAN**

The Contractor shall cooperate with local fire prevention authorities in eliminating hazardous fire conditions and shall implement the following fire plan under the direction of the Engineer:

- A. The Contractor shall be responsible for:
  1. obtaining the phone number of the nearest fire suppression agency and providing this phone number to the Engineer as a first order of work,
  2. immediately reporting to the nearest fire suppression agency fires occurring within the limits of the project,
  3. preventing project personnel from setting open fires not part of the work, unless the Fire Index is at "Low," or

the determination of the Fire Index is suspended or, if in an area not covered by the Fire Index rating system, the Engineer determines that the fire hazard is negligible,

4. preventing the escape of fires caused directly or indirectly as a result of project operations and extinguishing these fires.
- B. Except for motor trucks, truck tractors, buses and passenger vehicles, the Contractor shall equip all hydro-carbon fueled engines, both stationary and mobile, including motorcycles, with spark arresters that meet United States Forest Service Standards as specified in the Forest Service Spark Arrester Guide and shall maintain the spark arresters in good operating condition. Spark arresters are not required by the State Department of Forestry or the United States Forest Service on equipment powered by properly maintained exhaust-driven turbo-charged engines or when equipped with scrubbers with properly maintained water levels. The Forest Service Spark Arrester Guide is available at the District Offices of the Department of Transportation.
- C. Toilets shall have a metal receptacle, at least 150 mm in diameter by 200 mm deep, half-filled with sand for ashes and discarded smokes, and within easy reach of anyone utilizing the facility.
- D. Equipment service areas, parking areas and gas and oil storage areas shall be located so that there is no flammable material within a radius of at least 15 m of these areas. Small mobile or stationary engine sites shall be cleared of flammable material for a radius of at least 4.6 m from the engine.
- E. Temporary, aboveground, fuel storage tanks may be used on construction sites for diesel fuel only and shall not exceed 1,000-gallon liquid capacity. Such installations shall comply with all applicable provisions of the Roseville Fire Code. A Fire Department permit shall be obtained prior to the placement of such tanks on the site. For fuel tank permit, contact the Fire Prevention Bureau, at (916) 774-5821.
- F. Construction material and vehicles shall not obstruct fire apparatus access to fire apparatus roads, fire hydrants or adjacent buildings.
- G. The burning of combustible construction materials and trash is prohibited.
- H. If site survey or earth moving work results in the discovery of hazardous materials in containers, or what appears to be hazardous wastes released into the ground, the Contractor or applicant shall immediately report the finding to the Roseville Fire Department (RFD) at (916) 774-5821. All suspected areas shall be marked off with approved signage or caution tape until such time that a representative from the Fire Department determines whether the release is reportable or not and if site remediation is required.
- I. Barricades shall be provided to protect any fire hydrant, fire department control device, or other possible pertinent equipment or devices that may be subject to vehicular damage.
- J. Prior to commencing construction, the Contractor shall contact the Roseville Fire Department (Fire Inspector, at (916) 774-5827 to coordinate work site identification names so that, in the event of an accident, the RFD will be able to determine which Fire Station shall be called to respond.
- K. The street address of the construction site shall be clearly identified at all entrances into the project (job office/yard). Such numbers shall be clearly visible from the street fronting the property and shall contrast in color with their background.

Full compensation for conforming to the provisions herein shall be considered as included in the prices paid for the various contract items of work and no separate payment will be made therefor.

#### **SECTION 6. (BLANK)**

#### **SECTION 7. (BLANK)**

#### **SECTION 8. MATERIALS**

#### **SECTION 8-1. MISCELLANEOUS**

##### **8-1.01 SUBSTITUTION OF NON-METRIC MATERIALS AND PRODUCTS**

Only materials and products conforming to the requirements of the specifications shall be incorporated in the work. When metric materials and products are not available, and when approved by the Engineer, and at no cost to the State, materials and products in the United States Standard Measures which are of equal quality and of the required properties and characteristics for the purpose intended, may be substituted for the equivalent metric materials and products, subject to the following provisions:

- A. Materials and products shown on the plans or in the special provisions as being equivalent may be substituted for the metric materials and products specified or detailed on the plans.
- B. Before other non-metric materials and products will be considered for use, the Contractor shall furnish, at the Contractor's expense, evidence satisfactory to the Engineer that the materials and products proposed for use are

equal to or better than the materials and products specified or detailed on the plans. The burden of proof as to the quality and suitability of substitutions shall be upon the Contractor and the Contractor shall furnish necessary information as required by the Engineer. The Engineer will be the sole judge as to the quality and suitability of the substituted materials and products and the Engineer's decision will be final.

- C. When the Contractor elects to substitute non-metric materials and products, including materials and products shown on the plans or in the special provisions as being equivalent, the list of sources of material specified in Section 6-1.01, "Source of Supply and Quality of Materials," of the Standard Specification shall include a list of substitutions to be made and contract items involved. In addition, for a change in design or details, the Contractor shall submit plans and working drawings in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The plans and working drawings shall be submitted at least 7 days before the Contractor intends to begin the work involved.

Unless otherwise specified, the following substitutions of materials and products will be allowed:

#### SUBSTITUTION TABLE FOR SIZES OF HIGH STRENGTH STEEL FASTENERS

ASTM Designation: A 325M

METRIC SIZE SHOWN ON THE PLANS mm x thread pitch	SIZE TO BE SUBSTITUTED inch
M16 x 2	5/8
M20 x 2.5	3/4
M22 x 2.5	7/8
M24 x 3	1
M27 x 3	1-1/8
M30 x 3.5	1-1/4
M36 x 4	1-1/2

#### SUBSTITUTION TABLE FOR PLAIN WIRE REINFORCEMENT

ASTM Designation: A 82

METRIC SIZE SHOWN ON THE PLANS mm <sup>2</sup>	SIZE TO BE SUBSTITUTED inch <sup>2</sup> x 100
MW9	W1.4
MW10	W1.6
MW13	W2.0
MW15	W2.3
MW19	W2.9
MW20	W3.1
MW22	W3.5
MW25	W3.9, except W3.5 in piles only
MW26	W4.0
MW30	W4.7
MW32	W5.0
MW35	W5.4
MW40	W6.2
MW45	W6.5
MW50	W7.8
MW55	W8.5, except W8.0 in piles only
MW60	W9.3
MW70	W10.9, except W11.0 in piles only
MW80	W12.4
MW90	W14.0
MW100	W15.5

#### SUBSTITUTION TABLE FOR BAR REINFORCEMENT

METRIC BAR DESIGNATION NUMBER <sup>1</sup> SHOWN ON THE PLANS	BAR DESIGNATION NUMBER <sup>2</sup> TO BE SUBSTITUTED
10	3
13	4
16	5
19	6
22	7
25	8
29	9
32	10
36	11
43	14
57	18

<sup>1</sup>Bar designation numbers approximate the number of millimeters of the nominal diameter of the bars.

<sup>2</sup>Bar numbers are based on the number of eighths of an inch included in the nominal diameter of the bars.

No adjustment will be required in spacing or total number of reinforcing bars due to a difference in minimum yield strength between metric and non-metric bars.



SUBSTITUTION TABLE FOR SIZES OF:

(1) STEEL FASTENERS FOR GENERAL APPLICATIONS (ASTM Designation: A 307 or AASHTO Designation: M 314, Grade 36 or 55), and

(2) HIGH STRENGTH STEEL FASTENERS (ASTM Designation: A 325 or A 449)

METRIC SIZE SHOWN ON THE PLANS mm	SIZE TO BE SUBSTITUTED inch
6 or 6.35	1/4
8 or 7.94	5/16
10 or 9.52	3/8
11 or 11.11	7/16
13 or 12.70	1/2
14 or 14.29	9/16
16 or 15.88	5/8
19 or 19.05	3/4
22 or 22.22	7/8
24, 25, or 25.40	1
29 or 28.58	1-1/8
32 or 31.75	1-1/4
35 or 34.93	1-3/8
38 or 38.10	1-1/2
44 or 44.45	1-3/4
51 or 50.80	2
57 or 57.15	2-1/4
64 or 63.50	2-1/2
70 or 69.85	2-3/4
76 or 76.20	3
83 or 82.55	3-1/4
89 or 88.90	3-1/2
95 or 95.25	3-3/4
102 or 101.60	4

**SUBSTITUTION TABLE FOR NOMINAL THICKNESS OF SHEET METAL**

UNCOATED HOT AND COLD ROLLED SHEETS		HOT-DIPPED ZINC COATED SHEETS (GALVANIZED)	
METRIC THICKNESS SHOWN ON THE PLANS mm	GAGE TO BE SUBSTITUTED inch	METRIC THICKNESS SHOWN ON THE PLANS mm	GAGE TO BE SUBSTITUTED inch
7.94	0.3125	4.270	0.1681
6.07	0.2391	3.891	0.1532
5.69	0.2242	3.510	0.1382
5.31	0.2092	3.132	0.1233
4.94	0.1943	2.753	0.1084
4.55	0.1793	2.372	0.0934
4.18	0.1644	1.994	0.0785
3.80	0.1495	1.803	0.0710
3.42	0.1345	1.613	0.0635
3.04	0.1196	1.461	0.0575
2.66	0.1046	1.311	0.0516
2.28	0.0897	1.158	0.0456
1.90	0.0747	1.006 or 1.016	0.0396
1.71	0.0673	0.930	0.0366
1.52	0.0598	0.853	0.0336
1.37	0.0538	0.777	0.0306
1.21	0.0478	0.701	0.0276
1.06	0.0418	0.627	0.0247
0.91	0.0359	0.551	0.0217
0.84	0.0329	0.513	0.0202
0.76	0.0299	0.475	0.0187
0.68	0.0269	-----	-----
0.61	0.0239	-----	-----
0.53	0.0209	-----	-----
0.45	0.0179	-----	-----
0.42	0.0164	-----	-----
0.38	0.0149	-----	-----

**SUBSTITUTION TABLE FOR WIRE**

METRIC THICKNESS SHOWN ON THE PLANS mm	WIRE THICKNESS TO BE SUBSTITUTED inch	GAGE NO.
6.20	0.244	3
5.72	0.225	4
5.26	0.207	5
4.88	0.192	6
4.50	0.177	7
4.11	0.162	8
3.76	0.148	9
3.43	0.135	10
3.05	0.120	11
2.69	0.106	12
2.34	0.092	13
2.03	0.080	14
1.83	0.072	15
1.57	0.062	16
1.37	0.054	17
1.22	0.048	18
1.04	0.041	19
0.89	0.035	20

**SUBSTITUTION TABLE FOR PIPE PILES**

METRIC SIZE SHOWN ON THE PLANS mm x mm	SIZE TO BE SUBSTITUTED inch x inch
PP 360 x 4.55	NPS 14 x 0.179
PP 360 x 6.35	NPS 14 x 0.250
PP 360 x 9.53	NPS 14 x 0.375
PP 360 x 11.12	NPS 14 x 0.438
PP 406 x 12.70	NPS 16 x 0.500
PP 460 x T	NPS 18 x T"
PP 508 x T	NPS 20 x T"
PP 559 x T	NPS 22 x T"
PP 610 x T	NPS 24 x T"
PP 660 x T	NPS 26 x T"
PP 711 x T	NPS 28 x T"
PP 762 x T	NPS 30 x T"
PP 813 x T	NPS 32 x T"
PP 864 x T	NPS 34 x T"
PP 914 x T	NPS 36 x T"
PP 965 x T	NPS 38 x T"
PP 1016 x T	NPS 40 x T"
PP 1067 x T	NPS 42 x T"
PP 1118 x T	NPS 44 x T"
PP 1219 x T	NPS 48 x T"
PP 1524 x T	NPS 60 x T"

The thickness in millimeters (T) represents an exact conversion of the thickness in inches (T").

**SUBSTITUTION TABLE FOR STRUCTURAL TIMBER AND LUMBER**

METRIC MINIMUM DRESSED DRY, SHOWN ON THE PLANS mm x mm	METRIC MINIMUM DRESSED GREEN, SHOWN ON THE PLANS mm x mm	NOMINAL SIZE TO BE SUBSTITUTED inch x inch
19x89	20x90	1x4
38x89	40x90	2x4
64x89	65x90	3x4
89x89	90x90	4x4
140x140	143x143	6x6
140x184	143x190	6x8
184x184	190x190	8x8
235x235	241x241	10x10
286x286	292x292	12x12

**SUBSTITUTION TABLE FOR NAILS AND SPIKES**

METRIC COMMON NAIL, SHOWN ON THE PLANS  Length, mm Diameter, mm	METRIC BOX NAIL, SHOWN ON THE PLANS  Length, mm Diameter, mm	METRIC SPIKE, SHOWN ON THE PLANS Length, mm Diameter, mm	SIZE TO BE SUBSTITUTED Penny-weight
50.80 2.87	50.80 2.51	————	6d
63.50 3.33	63.50 2.87	————	8d
76.20 3.76	76.20 3.25	76.20 4.88	10d
82.55 3.76	82.55 3.25	82.55 4.88	12d
88.90 4.11	88.90 3.43	88.90 5.26	16d
101.60 4.88	101.60 3.76	101.60 5.72	20d
114.30 5.26	114.30 3.76	114.30 6.20	30d
127.00 5.72	127.00 4.11	127.00 6.68	40d
————	————	139.70 7.19	50d
————	————	152.40 7.19	60d

**SUBSTITUTION TABLE FOR IRRIGATION  
COMPONENTS**

METRIC WATER METERS, TRUCK LOADING STANDPIPES, VALVES, BACKFLOW PREVENTERS, FLOW SENSORS, WYE STRAINERS, FILTER ASSEMBLY UNITS, PIPE SUPPLY LINES, AND PIPE IRRIGATION SUPPLY LINES SHOWN ON THE PLANS DIAMETER NOMINAL (DN) mm	NOMINAL SIZE TO BE SUBSTITUTED  inch
15	1/2
20	3/4
25	1
32	1-1/4
40	1-1/2
50	2
65	2-1/2
75	3
100	4
150	6
200	8
250	10
300	12
350	14
400	16

Unless otherwise specified, substitutions of United States Standard Measures standard structural shapes corresponding to the metric designations shown on the plans and in conformance with the requirements in ASTM Designation: A 6/A 6M, Annex 2, will be allowed.

**8-1.02 PREQUALIFIED AND TESTED SIGNING AND DELINEATION MATERIALS**

The Department maintains the following list of Prequalified and Tested Signing and Delineation Materials. The Engineer shall not be precluded from sampling and testing products on the list of Prequalified and Tested Signing and Delineation Materials.

The manufacturer of products on the list of Prequalified and Tested Signing and Delineation Materials shall furnish the Engineer a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for each type of traffic product supplied.

For those categories of materials included on the list of Prequalified and Tested Signing and Delineation Materials, only those products shown within the listing may be used in the work. Other categories of products, not included on the list of Prequalified and Tested Signing and Delineation Materials, may be used in the work provided they conform to the requirements of the Standard Specifications.

Materials and products may be added to the list of Prequalified and Tested Signing and Delineation Materials if the manufacturer submits a New Product Information Form to the New Product Coordinator at the Transportation Laboratory. Upon a Departmental request for samples, sufficient samples shall be submitted to permit performance of required tests. Approval of materials or products will depend upon compliance with the specifications and tests the Department may elect to perform.

## **PAVEMENT MARKERS, PERMANENT TYPE**

### **Retroreflective With Abrasion Resistant Surface (ARS)**

- A. Apex, Model 921AR (100 mm x 100 mm)
- B. Avery Dennison (formerly Stimsonite), Models C88 (100 mm x 100 mm), 911 (100 mm x 100 mm) and 953 (70 mm x 114 mm)
- C. Ray-O-Lite, Model "AA" ARS (100 mm x 100 mm)
- D. 3M Series 290 (89 mm x 100 mm)
- E. 3M Series 290 PSA, with pressure sensitive adhesive pad (89 mm x 100 mm)

### **Retroreflective With Abrasion Resistant Surface (ARS)**

(for recessed applications only)

- A. Avery Dennison (formerly Stimsonite), Model 948 (58 mm x 119 mm)
- B. Avery Dennison (formerly Stimsonite), Model 944SB (51 mm x 100 mm)\*
- C. Ray-O-Lite, Model 2002 (58 mm x 117 mm)
- D. Ray-O-Lite, Model 2004 ARS (51 mm x 100 mm)\*

\*For use only in 114 mm wide (older) recessed slots

### **Non-Reflective, 100 mm Round**

- A. Alpine Products, "D-Dot" and "ANR" (ABS)
- B. Apex Universal (Ceramic)
- C. Apex Universal, Models 929 (ABS) and 929PP (Polypropylene)
- D. Elgin Molded Plastics, "Empco-Lite" Model 900 (ABS)
- E. Hi-Way Safety, Inc., Models P20-2000W and 2001Y (ABS)
- F. Interstate Sales, "Diamond Back" (ABS) and (Polypropylene)
- G. Novabrite Models Cdot (White) Cdot-y (Yellow), Ceramic
- H. Novabrite Models Adot-w (White) Adot-y (Yellow), (ABS)
- I. Novabrite Models Pdot-w (White) Pdot-y (Yellow), Polypropylene
- J. Road Creations, Model RCB4NR (Acrylic)
- K. Three D Traffic Works TD10000 (ABS), TD10500 (Polypropylene)
- L. Zumar Industries, "Titan TM40A" (ABS)

## **PAVEMENT MARKERS, TEMPORARY TYPE**

### **Temporary Markers For Long Term Day/Night Use (6 months or less)**

- A. Apex Universal, Model 924 (100 mm x 100 mm)
- B. Elgin Molded Plastics, "Empco-Lite" Model 901 (100 mm x 100 mm)
- C. Road Creations, Model R41C (100 mm x 100 mm)
- D. Vega Molded Products "Temporary Road Marker" (75 mm x 100 mm)

### **Temporary Markers For Short Term Day/Night Use (14 days or less)**

(For seal coat or chip seal applications, clear protective covers are required)

- A. Apex Universal, Model 932
- B. Bunzl Extrusion, Models T.O.M., T.R.P.M., and "HH" (High Heat)
- C. Hi-Way Safety, Inc., Model 1280/1281

## **STRIPING AND PAVEMENT MARKING MATERIAL**

### **Permanent Traffic Striping and Pavement Marking Tape**

- A. Advanced Traffic Marking, Series 300 and 400
- B. Brite-Line, Series 1000
- C. Brite-Line, "DeltaLine XRP"
- D. Swarco Industries, "Director 35" (For transverse application only)
- E. Swarco Industries, "Director 60"
- F. 3M, "Stamark" Series 380 and 5730
- G. 3M, "Stamark" Series 420 (For transverse application only)

**Temporary (Removable) Striping and Pavement Marking Tape (6 months or less)**

- A. Advanced Traffic Marking, Series 200
- B. Brite-Line, Series 100
- C. Garlock Rubber Technologies, Series 2000
- D. P.B. Laminations, Aztec, Grade 102
- E. Swarco Industries, "Director-2"
- F. Trelleborg Industri, R140 Series
- G. 3M, Series 620 "CR", and Series A750
- H. 3M, Series A145, Removable Black Line Mask  
(Black Tape: for use only on Asphalt Concrete Surfaces)
- I. Advanced Traffic Marking Black "Hide-A-Line"  
(Black Tape: for use only on Asphalt Concrete Surfaces)
- J. Brite-Line "BTR" Black Removable Tape  
(Black Tape: for use only on Asphalt Concrete Surfaces)
- K. Trelleborg Industri, RB-140  
(Black Tape: for use only on Asphalt Concrete Surfaces)

**Preformed Thermoplastic (Heated in place)**

- A. Avery Dennison, "Hotape"
- B. Flint Trading, "Premark," "Premark 20/20 Flex," and "Premark 20/20 Flex Plus"

**Ceramic Surfacing Laminate, 150 mm x 150 mm**

- A. Safeline Industries/Highway Ceramics, Inc.

**CLASS 1 DELINEATORS**

**One Piece Driveable Flexible Type, 1700 mm**

- A. Bunzl Extrusion, "Flexi-Guide Models 400 and 566"
- B. Carsonite, Curve-Flex CFRM-400
- C. Carsonite, Roadmarker CRM-375
- D. FlexStake, Model 654 TM
- E. GreenLine Models HWD1-66 and CGD1-66
- F. J. Miller Industries, Model JMI-375 (with soil anchor)

**Special Use Type, 1700 mm**

- A. Bunzl Extrusion, Model FG 560 (with 450 mm U-Channel base)
- B. Carsonite, "Survivor" (with 450 mm U-Channel base)
- C. Carsonite, Roadmarker CRM-375 (with 450 mm U-Channel base)
- D. FlexStake, Model 604
- E. GreenLine Models HWDU and CGD (with 450 mm U-Channel base)
- F. Impact Recovery Model D36, with #105 Driveable Base
- G. Safe-Hit with 200 mm pavement anchor (SH248-GP1)
- H. Safe-Hit with 380 mm soil anchor (SH248-GP2) and with 450 mm soil anchor (SH248-GP3)

**Surface Mount Type, 1200 mm**

- A. Bent Manufacturing Company, Masterflex Model MF-180EX-48
- B. Carsonite, "Super Duck II"
- C. FlexStake, Surface Mount, Models 704 and 754 TM
- D. Impact Recovery Model D48, with #101 Fixed (Surface-Mount) Base
- E. Three D Traffic Works "Channelflex" Part No. 522248W

## **CHANNELIZERS**

### **Surface Mount Type, 900 mm**

- A. Bent Manufacturing Company, Masterflex Models MF-360-36 (Round) and MF-180-36 (Flat)
- B. Bunzl Extrusion, Flexi-Guide Models FG300LD and FG300UR
- C. Carsonite, "Super Duck" (Flat SDF-436, Round SDR-336)
- D. Carsonite, "Super Duck II" Model SDCF203601MB "The Channelizer"
- E. FlexStake, Surface Mount, Models 703 and 753 TM
- F. GreenLine, Model SMD-36
- G. Hi-Way Safety, Inc. "Channel Guide Channelizer" Model CGC36
- H. Impact Recovery Model D36, with #101 Fixed (Surface-Mount) Base
- I. Repo, Models 300 and 400
- J. Safe-Hit, Guide Post, Model SH236SMA
- K. The Line Connection, "Dura-Post" Model DP36-3 (Permanent)
- L. The Line Connection, "Dura-Post" Model DP36-3C (Temporary)
- M. Three D Traffic Works "Channelflex" Part No. 522053W

### **Lane Separation System**

- A. Bunzl "Flexi-Guide (FG) 300 Curb System"
- B. Qwick Kurb, "Klemmfix Guide System"
- C. Recycled Technology, Inc. "Safe-Lane System"

## **CONICAL DELINEATORS, 1070 mm**

(For 700 mm Traffic Cones, see Standard Specifications)

- A. Bent Manufacturing Company "T-Top"
- B. Plastic Safety Systems "Navigator-42"
- C. Radiator Specialty Company "Enforcer"
- D. Roadmaker Company "Stacker"
- E. Traffix Devices "Grabber"

## **OBJECT MARKERS**

### **Type "K", 450 mm**

- A. Bunzl, Model FG318PE
- B. Carsonite, Model SMD 615
- C. FlexStake, Model 701 KM
- D. Repo, Models 300 and 400
- E. Safe-Hit, Model SH718SMA
- F. The Line Connection, Model DP21-4K

### **Type "K-4" / "Q" Object Markers, 600 mm**

- A. Bent Manufacturing "Masterflex" Model MF-360-24
- B. Bunzl Extrusion, Model FG324PE
- C. Carsonite, Super Duck II
- D. FlexStake, Model 701KM
- E. Repo, Models 300 and 400
- F. Safe-Hit, Models SH8 24SMA\_WA and SH8 24GP3\_WA
- G. The Line Connection, Model DP21-4Q
- H. Three D Traffic Works "Q" Marker, Part No. 531702W

## **CONCRETE BARRIER MARKERS AND TEMPORARY RAILING (TYPE K) REFLECTORS**

### **Impactable Type**

- A. ARTUK, "FB"
- B. Bunzl Extrusion, Models PCBM-12 and PCBM-T12
- C. Duraflex Corp., "Flexx 2020" and "Electriflexx"
- D. Hi-Way Safety, Inc., Model GMKRM100
- E. Plastic Safety Systems "BAM" Models OM-BARR and OM-BWAR



- F. Sun-Lab Technology, "Safety Guide Light Model TM-5"
- G. Three D Traffic Works "Roadguide" TD9000 Series

#### **Non-Impactable Type**

- A. ARTUK, JD Series
- B. Plastic Safety Systems "BAM" Models OM-BITARW and OM-BITARA
- C. Vega Molded Products, Models GBM and JD

#### **THREE BEAM BARRIER MARKERS**

(For use to the left of traffic)

- A. Bunzl Extrusion, "Mini" (75 mm x 254 mm)
- B. Duraflex Corp., "Railrider"

#### **CONCRETE BARRIER DELINEATORS, 400 mm**

(For use to the right of traffic)

- A. Bunzl Extrusion, Model PCBM T-16
- B. Safe-Hit, Model SH216RBM
- C. Sun-Lab Technology, "Safety Guide Light, Model TM16," (75 mm x 300 mm)
- D. Three D Traffic Works "Roadguide" TD9416 Series

#### **CONCRETE BARRIER-MOUNTED MINI-DRUM (260 mm x 360 mm x 570 mm)**

- A. Stinson Equipment Company "SaddleMarker"

#### **SOUND WALL DELINEATOR**

(Applied vertically. Place top of 75 mm x 300 mm reflective element at 1200 mm above roadway)

- A. Bunzl Extrusion, PCBM S-36
- B. Sun-Lab Technology, "Safety Guide Light, Model SM12," (75 mm x 300 mm)

#### **GUARD RAILING DELINEATOR**

(Place top of reflective element at 1200 mm above plane of roadway)

##### **Wood Post Type, 686 mm**

- A. Bunzl Extrusion, FG 427 and FG 527
- B. Carsonite, Model 427
- C. FlexStake, Model 102 GR
- D. GreenLine GRD 27
- E. J. Miller Model JMI-375G
- F. Safe-Hit, Model SH227GRD
- G. Three D Traffic Works "Guardflex" TD5100 Series

##### **Steel Post Type**

- A. Carsonite, Model CFGR-327 with CFGRBK300 Mounting Bracket

#### **RETROREFLECTIVE SHEETING**

##### **Channelizers, Barrier Markers, and Delineators**

- A. Avery Dennison T-6500 Series (Formerly Stimsonite, Series 6200) (For rigid substrate devices only)
- B. Avery Dennison WR-6100 Series
- C. Nippon Carbide, Flexible Ultralite Grade (ULG) II
- D. Reflexite, PC-1000 Metalized Polycarbonate
- E. Reflexite, AC-1000 Acrylic
- F. Reflexite, AP-1000 Metalized Polyester
- G. Reflexite, Conformalight, AR-1000 Abrasion Resistant Coating
- H. 3M, High Intensity

##### **Traffic Cones, 330 mm Sleeves**

- A. Reflexite SB (Polyester), Vinyl or "TR" (Semi-transparent)

**Traffic Cones, 100 mm and 150 mm Sleeves**

- A. Nippon Carbide, Flexible Ultralite Grade (ULG) II
- B. Reflexite, Vinyl, "TR" (Semi-transparent) or "Conformalight"
- C. 3M Series 3840

**Barrels and Drums**

- A. Avery Dennison WR-6100
- B. Nippon Carbide, Flexible Ultralite Grade (ULG) II
- C. Reflexite, "Conformalight", "Super High Intensity" or "High Impact Drum Sheeting"
- D. 3M Series 3810

**Barricades: Type I, Medium-Intensity (Typically Enclosed Lens, Glass-Bead Element)**

- A. American Decal, Adcolite
- B. Avery Dennison, T-1500 and T-1600 series
- C. 3M Engineer Grade, Series 3170

**Barricades: Type II, Medium-High-Intensity (Typically Enclosed Lens, Glass-Bead Element)**

- A. Avery Dennison, T-2500 Series
- B. Kiwalite Type II
- C. Nikkalite 1800 Series

**Signs: Type II, Medium-High-Intensity (Typically Enclosed Lens, Glass-Bead Element)**

- A. Avery Dennison, T-2500 Series
- B. Kiwalite, Type II
- C. Nikkalite 1800 Series

**Signs: Type III, High-Intensity (Typically Encapsulated Glass-Bead Element)**

- A. Avery Dennison, T-5500 Series
- B. Nippon Carbide, Nikkalite Brand Ultralite Grade II
- C. 3M Series 3870

**Signs: Type IV, High-Intensity (Typically Unmetallized Microprismatic Element)**

- A. Avery Dennison, T-6500 Series (Formerly Stimsonite Series 6200)
- B. Nippon Carbide, Crystal Grade, 94000 Series

**Signs: Type VI, Elastomeric (Roll-Up) High-Intensity, without Adhesive**

- A. Avery Dennison, WU-6014 (Fluorescent orange)
- B. Novabrite LLC, "Econobrite"
- B. Reflexite "Vinyl" (Orange)
- C. Reflexite "SuperBright" (Fluorescent orange)
- D. Reflexite "Marathon" (Fluorescent orange)
- E. 3M Series RS34 (Orange) and RS20 (Fluorescent orange)

**Signs: Type VII, Super-High-Intensity (Typically Unmetallized Microprismatic Element)**

- A. 3M LDP Series 3970

**Signs: Type VIII, Super-High-Intensity (Typically Unmetallized Microprismatic Element)**

- A. Avery Dennison, T-7500 Series

**Signs: Type IX, Very-High-Intensity (Typically Unmetallized Microprismatic Element)**

- A. 3M VIP Series 3990 Diamond Grade

**SPECIALTY SIGNS**

- A. All Sign Products, STOP Sign (All Plastic), 750 mm
- B. Reflexite "Endurance" Work Zone Sign (with Semi-Rigid Plastic Substrate)

## **SIGN SUBSTRATE**

### **Fiberglass Reinforced Plastic (FRP)**

- A. Fiber-Brite
- B. Sequentia, "Polyplate"
- C. Inteplast Group "InteCel" (13 mm for Post-Mounted CZ Signs, 1200 mm or less)

### **Aluminum Composite**

- A. Alcan Composites "Dibond Material, 2 mm"
- B. Mitsubishi Chemical America, Alpolic 350

## **8-1.03 STATE-FURNISHED MATERIALS**

Attention is directed to Section 6-1.02, "State-Furnished Materials," of the Standard Specifications and these special provisions.

The following materials will be furnished to the Contractor:

- A. Sign panels for roadside signs and overhead sign structures.
- B. Hardware for mounting sign panels as follows:
  - 1. Closure inserts.
  - 2. Aluminum bolts and nuts and steel beveled washers for mounting laminated sign panels on overhead sign structures.
  - 3. Aluminum bolts, nuts, and washers for mounting overhead formed panels.
- C. Disks for survey monuments.
- D. Light Emitting Diode modules for vehicular traffic signal units, Type A pedestrian signals, and flashing beacon units.
- E. Model 170 controller assembly, including controller unit, completely wired controller cabinet, and inductive loop detector sensor units.
- F. Modems
- G. Battery Back-Up Systems for Traffic Signals
- H. Emergency Vehicle Detection System
- I. Non-reflective identification strips for pull box markers.

Completely wired controller cabinets, with auxiliary equipment but without controller unit, will be furnished to the Contractor at Caltrans District 3 Shop, 6010 Folsom Boulevard, Sacramento, California.

The Contractor shall notify the Engineer not less than 48 hours before State-furnished material is to be picked up by the Contractor. A full description of the material and the time the material will be picked up shall be provided.

Portable changeable message signs will be furnished to the Contractor at the Roseville Corporation Yard located at 2005 Hilltop Circle. The Contractor shall notify the Engineer not less than 48 hours before the portable changeable message signs are to be picked up by the Contractor.

## **8-1.04 ENGINEERING FABRICS**

Engineering fabrics shall conform to the provisions in Section 88, "Engineering Fabrics," of the Standard Specifications and these special provisions.

Filter fabric for this project shall be ultraviolet (UV) ray protected.

## **SECTION 8-2. CONCRETE**

### **8-2.01 PORTLAND CEMENT CONCRETE**

Portland cement concrete shall conform to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications and these special provisions.

References to Section 90-2.01, "Portland Cement," of the Standard Specifications shall mean Section 90-2.01, "Cement," of the Standard Specifications.

Mineral admixture shall be combined with cement in conformance with the provisions in Section 90-4.08, "Required Use of Mineral Admixtures," of the Standard Specifications for the concrete materials specified in Section 56-2, "Roadside

Signs," of the Standard Specifications.

The requirements of Section 90-4.08, "Required Use of Mineral Admixture," of the Standard Specifications shall not apply to Section 19-3.025C, "Soil Cement Bedding," of the Standard Specifications.

The Department maintains a list of sources of fine and coarse aggregate that have been approved for use with a reduced amount of mineral admixture in the total amount of cementitious material to be used. A source of aggregate will be considered for addition to the approved list if the producer of the aggregate submits to the Transportation Laboratory certified test results from a qualified testing laboratory that verify the aggregate complies with the requirements. Prior to starting the testing, the aggregate test shall be registered with the Department. A registration number can be obtained by calling (916) 227-7228. The registration number shall be used as the identification for the aggregate sample in correspondence with the Department. Upon request, a split of the tested sample shall be provided to the Department. Approval of aggregate will depend upon compliance with the specifications, based on the certified test results submitted, together with any replicate testing the Department may elect to perform. Approval will expire 3 years from the date the most recent registered and evaluated sample was collected from the aggregate source.

Qualified testing laboratories shall conform to the following requirements:

- A. Laboratories performing ASTM Designation: C 1293 shall participate in the Cement and Concrete Reference Laboratory (CCRL) Concrete Proficiency Sample Program and shall have received a score of 3 or better on all tests of the previous 2 sets of concrete samples.
- B. Laboratories performing ASTM Designation: C 1260 shall participate in the Cement and Concrete Reference Laboratory (CCRL) Pozzolan Proficiency Sample Program and shall have received a score of 3 or better on the shrinkage and soundness tests of the previous 2 sets of pozzolan samples.

Aggregates on the list shall conform to one of the following requirements:

- A. When the aggregate is tested in conformance with the requirements in California Test 554 and ASTM Designation: C 1293, the average expansion at one year shall be less than or equal to 0.040 percent; or
- B. When the aggregate is tested in conformance with the requirements in California Test 554 and ASTM Designation: C 1260, the average of the expansion at 16 days shall be less than or equal to 0.15 percent.

The amounts of cement and mineral admixture used in cementitious material shall be sufficient to satisfy the minimum cementitious material content requirements specified in Section 90-1.01, "Description," or Section 90-4.05, "Optional Use of Chemical Admixtures," of the Standard Specifications and shall conform to the following:

- A. The minimum amount of cement shall not be less than 75 percent by mass of the specified minimum cementitious material content.
- B. The minimum amount of mineral admixture to be combined with cement shall be determined using one of the following criteria:
  - 1. When the calcium oxide content of a mineral admixture is equal to or less than 2 percent by mass, the amount of mineral admixture shall not be less than 15 percent by mass of the total amount of cementitious material to be used in the mix.
  - 2. When the calcium oxide content of a mineral admixture is greater than 2 percent by mass, and any of the aggregates used are not listed on the approved list as specified in these special provisions, then the amount of mineral admixture shall not be less than 25 percent by mass of the total amount of cementitious material to be used in the mix.
  - 3. When the calcium oxide content of a mineral admixture is greater than 2 percent by mass and the fine and coarse aggregates are listed on the approved list as specified in these special provisions, then the amount of mineral admixture shall not be less than 15 percent by mass of the total amount of cementitious material to be used in the mix.
  - 4. When a mineral admixture that conforms to the provisions for silica fume in Section 90-2.04, "Admixture Materials," of the Standard Specifications is used, the amount of mineral admixture shall not be less than 10 percent by mass of the total amount of cementitious material to be used in the mix.
  - 5. When a mineral admixture that conforms to the provisions for silica fume in Section 90-2.04, "Admixture Materials," of the Standard Specifications is used and the fine and coarse aggregates are listed on the approved list as specified in these special provisions, then the amount of mineral admixture shall not be less than 7 percent by mass of the total amount of cementitious material to be used in the mix.

- C. The total amount of mineral admixture shall not exceed 35 percent by mass of the total amount of cementitious

material to be used in the mix. Where Section 90-1.01, "Description," of the Standard Specifications specifies a maximum cementitious content in kilograms per cubic meter, the total mass of cement and mineral admixture per cubic meter shall not exceed the specified maximum cementitious material content.

Unless otherwise specified, mineral admixture will not be required in portland cement concrete used for precast concrete girders.

The Contractor will be permitted to use Type III portland cement for concrete used in the manufacture of precast concrete members.

## **SECTION 8-3. WELDING**

### **8-3.01 WELDING**

#### **GENERAL**

Flux core welding electrodes conforming to the requirements of AWS A5.20 E6XT-4 or E7XT-4 shall not be used to perform welding for this project.

Wherever reference is made to the following AWS welding codes in the Standard Specifications, on the plans, or in these special provisions, the year of adoption for these codes shall be as listed:

AWS Code	Year of Adoption
D1.1	2000
D1.4	1998
D1.5	1995
D1.5 (metric only)	1996

Requirements of the AWS welding codes shall apply unless specified otherwise in the Standard Specifications, on the plans, or in these special provisions. Wherever the abbreviation AWS is used, it shall be equivalent to the abbreviations ANSI/AWS or ANSI/AASHTO/AWS.

Sections 6.1.2 through 6.1.4.3 of AWS D 1.1, Sections 7.1.1 and 7.1.2 of AWS D 1.4, and Sections 6.1.1.1 through 6.1.3.3 of AWS D 1.5 are replaced with the following:

Quality Control (QC) shall be the responsibility of the Contractor. As a minimum, the Contractor shall perform inspection and testing of each weld joint prior to welding, during welding, and after welding as specified in this section and as necessary to ensure that materials and workmanship conform to the requirements of the contract documents.

The QC Inspector shall be the duly designated person who acts for and on behalf of the Contractor for inspection, testing, and quality related matters for all welding.

Quality Assurance (QA) is the prerogative of the Engineer. The QA Inspector is the duly designated person who acts for and on behalf of the Engineer.

The QC Inspector shall be responsible for quality control acceptance or rejection of materials and workmanship, and shall be currently certified as an AWS Certified Welding Inspector (CWI) in conformance with the requirements in AWS QC1, "Standard and Guide for Qualification of Welding Inspectors."

The QC Inspector may be assisted by an Assistant QC Inspector provided that this individual is currently certified as an AWS Certified Associate Welding Inspector (CAWI) in conformance with the requirements in AWS QC1, "Standard and Guide for Qualification of Welding Inspectors," or has equivalent qualifications. The QC Inspector shall monitor the Assistant QC Inspector's work, and shall be responsible for signing all reports.

When the term "Inspector" is used without further qualification, it shall refer to the QC Inspector.

Section 6.14.6, "Personnel Qualification," of AWS D 1.1, Section 7.7.6, "Personnel Qualification," of AWS D 1.4, and Section 6.1.3.4, "Personnel Qualification," of AWS D 1.5 are replaced with the following:

Personnel performing nondestructive testing (NDT) shall be qualified and certified in conformance with the requirements of the American Society for Nondestructive Testing (ASNT) Recommended Practice No. SNT-TC-1A and the Written Practice of the NDT firm. The Written Practice of the NDT firm shall meet or exceed the guidelines of the ASNT Recommended Practice No. SNT-TC-1A. Only individuals who are 1) certified as an NDT Level II, or 2) Level III technicians who hold a current ASNT Level III certificate in that discipline and are authorized and certified to perform the work of Level II technicians, shall perform NDT, review the results, and prepare the written reports.

Section 6.5.4, "Scope of Examination," of AWS D 1.1 and Section 7.5.4 of AWS D 1.4 are replaced with the following:

The QC Inspector shall inspect and approve each joint preparation, assembly practice, welding technique, and the performance of each welder, welding operator, and tack welder to make certain that the applicable requirements of this code and the approved welding procedure specification (WPS) are met.

Section 6.5.4 of AWS D 1.5 is replaced with the following:

The QC Inspector shall inspect and approve each joint preparation, assembly practice, welding technique, and the performance of each welder, welding operator, and tack welder to make certain that the applicable requirements of this code and the approved WPS are met. The QC Inspector shall examine the work to make certain that it meets the requirements of Sections 3 and 9.21. The size and contour of all welds shall be measured using suitable gages. Visual inspection for cracks in welds and base metal, and for other discontinuities should be aided by strong light magnifiers, or such other devices as may be helpful. Acceptance criteria different from those specified in this code may be used when approved by the Engineer.

Section 6.6.5, "Nonspecified Nondestructive Testing Other Than Visual," of AWS D 1.1, Section 6.6.5 of AWS D 1.4 and Section 6.6.5 of AWS D 1.5 shall not apply.

For any welding, the Engineer may direct the Contractor to perform NDT that is in addition to the visual inspection or NDT specified in the AWS welding codes, in the Standard Specifications, or in these special provisions. Additional NDT required by the Engineer, will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications. Should any welding deficiencies be discovered by this additional NDT, the cost of the testing will not be paid for as extra work but shall be at the Contractor's expense.

Required repair work to correct welding deficiencies, whether discovered by the required visual inspection or NDT, or by additional NDT directed by the Engineer, and any associated delays or expenses caused to the Contractor by performing these repairs, shall be at the Contractor's expense.

The Engineer shall have the authority to verify the qualifications or certifications of any welder, QC Inspector, or NDT personnel to specified levels by retests or other means.

A sufficient number of QC Inspectors shall be provided to ensure continuous inspection when any welding is being performed. Continuous inspection, as a minimum, shall include (1) having QC Inspectors continually present on the shop floor or project site when any welding operation is being performed, and (2) having a QC Inspector within such close proximity of all welding operations so that inspections by the QC Inspector of each operation, at each welding location, shall not lapse for a period exceeding 30 minutes.

Inspection and approval of all joint preparations, assembly practices, welding techniques, and the performance of each welder, welding operator, and tack welder shall be documented by the QC Inspector on a daily basis for each day that welding is performed. The QC Inspector shall confirm and document compliance with the requirements of the AWS code criteria and the requirements of these special provisions on all weld joints before welding, during welding, and after the completion of each weld.

When joint details that are not prequalified by the applicable AWS codes are proposed for use in the work, welders using these details shall perform a qualification test plate using the approved WPS variables and the joint detail to be used in production. The test plate shall be the maximum thickness to be used in production. The test plate shall be mechanically or radiographically tested as directed by the Engineer. Mechanical and radiographic testing and acceptance criteria shall be as specified in the applicable AWS codes.

The period of effectiveness for a welder's or welding operator's qualification shall be a maximum of 3 years for the same weld process, welding position, and weld type. A valid qualification at the beginning of work on a contract will be acceptable for the entire period of the contract, as long as the welder's work remains satisfactory.

#### **PAYMENT**

Full compensation for conforming to the requirements of this section shall be considered as included in the contract prices paid for the various items of work involved and no additional compensation will be allowed therefor.

### **SECTION 9. DESCRIPTION OF BRIDGE WORK**

The bridge work to be done consists, in general, of constructing the Douglas Boulevard/I-80 Interchange bridge ramp structure, cut and cover tunnel, pumping plant and retaining walls briefly described as follows:

#### **DOUGLAS – SUNRISE CONNECTOR OVERCROSSING (Bridge Number 19-0018)**

Contract No. 03-375604

A five span cast-in place prestressed concrete box girder highway ramp over I-80, approximately 166.7 meters long and 8.67 meters wide, supported on prestressed concrete piles and spread footings. The design includes mechanically stabilized embankment retaining walls at one end of the bridge.

**SUNRISE-E80 ON RAMP TUNNEL  
(Bridge Number 19-0006)**

A cut-and-cover cast-in-place reinforced concrete highway tunnel approximately 269.0 meters long and 10.45 meters wide. Design includes reinforced concrete retaining walls, a pumping plant, ventilation, lighting, and fire detection and protection systems.

**SUNRISE-E80 ON RAMP TUNNEL OPERATION BUILDING**

A semi-underground cast-in-place reinforced concrete building housing mechanical and electrical equipment for support of operational and emergency facilities on the Sunrise-E80 On Ramp Tunnel such as pumping, ventilation and lighting.

**SECTION 10. CONSTRUCTION DETAILS**

**SECTION 10-1. GENERAL**

**10-1.00 CONSTRUCTION PROJECT INFORMATION SIGNS**

Before any major physical construction work readily visible to highway users is started on this contract, the Contractor shall furnish and erect 2 Type 2 Construction Project Information signs at the locations designated by the Engineer.

The signs and overlays shall be of a type and material consistent with the estimated time of completion of the project and shall conform to the details shown on the plans.

The sign letters, border and the Department's construction logos shall conform to the colors (non-reflective) and details shown on the plans, and shall be on a white background (non-reflective). The colors blue and orange shall conform to PR Color Number 3 and Number 6, respectively, as specified in the Federal Highway Administration's Color Tolerance Chart.

The sign message to be used for fund types shall consist of the following, in the order shown:

FEDERAL HIGHWAY TRUST FUNDS
STATE HIGHWAY FUNDS

The sign message to be used for type of work shall consist of the following:

**HIGHWAY CONSTRUCTION**

The sign message to be used for the Year of Completion of Project Construction will be furnished by the Engineer. The Contractor shall furnish and install the "Year" sign overlay within 10 working days of notification of the year date to be used.

The letter sizes to be used shall be as shown on the plans. The information shown on the signs shall be limited to that shown on the plans.

The signs shall be kept clean and in good repair by the Contractor.

Upon completion of the work, the signs shall be removed and disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13 of the Standard Specifications.

Full compensation for furnishing, erecting, maintaining, and removing and disposing of the construction project information signs shall be considered as included in the contract lump sum price paid for construction area signs and no additional compensation will be allowed therefor.

**10-1.01 ORDER OF WORK**

Order of work shall conform to the provisions in Section 5-1.05, "Order of Work," of the Standard Specifications and these special provisions.

Copies of the following Materials Information are available for inspection at the North Region Construction Office at 379-A Colusa Highway, Yuba City, California 95991:

1. Foundation Investigation (Connector Structure)

2. Foundation Investigation (Tunnel)
3. Materials Investigation (Project)
4. Latest Chevron's Groundwater Monitoring Quarterly Report
5. CAL OSHA Soil Classification Document

Attention is directed to "Miscellaneous Concrete Construction" of these special provisions regarding constructing a 600 mm by 600 mm test panel prior to constructing curb ramps with detectable warning surfaces.

Attention is directed to "Fire Plan" of these special provisions regarding cooperating with local fire prevention authorities.

Temporary railing (Type K) and temporary crash cushions shall be secured in place prior to commencing work for which the temporary railing and crash cushions are required.

Attention is directed to "Water Pollution Control" of these special provisions regarding the submittal and approval of the Storm Water Pollution Prevention Plan prior to performing work having potential to cause water pollution.

The first order of work shall be to place the order for the traffic signal equipment. The Engineer shall be furnished a statement from the vendor that the order for the traffic signal equipment has been received and accepted by the vendor.

The uppermost layer of new pavement shall not be placed until all underlying conduits and loop detectors have been installed.

Prior to commencement of the traffic signal functional test at any location, all items of work related to signal control shall be completed and all roadside signs, pavement delineation, and pavement markings shall be in place at that location.

Attention is directed to "Maintaining Traffic" and "Temporary Pavement Delineation" of these special provisions and to the stage construction sheets of the plans.

Attention is directed to "Progress Schedule (Critical Path Method)" of these special provisions regarding the submittal of a general time-scaled logic diagram within 10 days after approval of the contract. The diagram shall be submitted prior to performing any work that may be affected by any proposed deviations to the construction staging of the project.

The work shall be performed in conformance with the stages of construction shown on the plans. Nonconflicting work in subsequent stages may proceed concurrently with work in preceding stages, provided satisfactory progress is maintained in the preceding stages of construction.

In each stage, after completion of the preceding stage, the first order of work shall be the removal of existing pavement delineation as directed by the Engineer. Pavement delineation removal shall be coordinated with new delineation so that lane lines are provided at all times on traveled ways open to public traffic.

Before obliterating any pavement delineation (traffic stripes, pavement markings, and pavement markers) that is to be replaced on the same alignment and location, as determined by the Engineer, the pavement delineation shall be referenced by the Contractor, with a sufficient number of control points to reestablish the alignment and location of the new pavement delineation. The references shall include the limits or changes in striping pattern, including one- and 2-way barrier lines, limit lines, crosswalks and other pavement markings. Full compensation for referencing existing pavement delineation shall be considered as included in the contract prices paid for new pavement delineation and no additional compensation will be allowed therefor.

Prior to placing asphalt concrete (Type A) and open graded asphalt concrete, the Contractor shall cover all manholes, valve and monument covers, grates, or other exposed facilities located within the area of application, using a plastic or oil resistant construction paper secured to the facility being covered by tape or adhesive. The covered facilities shall be referenced by the Contractor, with a sufficient number of control points to relocate the facilities after the asphalt concrete (Type A) and open graded asphalt concrete has been placed. After completion of the paving operation, all covers shall be removed and disposed of in a manner satisfactory to the Engineer. Full compensation for covering manholes, valve and monument covers, grates, or other exposed facilities, referencing, and removing temporary cover shall be considered as included in the contract price paid per tonne for asphalt concrete (Type A) and asphalt concrete (open graded) and no additional compensation will be allowed therefor.

At the end of each working day if a difference in excess of 0.045-meter exists between the elevation of the existing pavement and the elevation of excavations within 2.4 m of the traveled way, material shall be placed and compacted against the vertical cuts adjacent to the traveled way. During excavation operations, native material may be used for this purpose; however, once placing of the structural section commences, structural material shall be used. The material shall be placed to the level of the elevation of the top of existing pavement and tapered at a slope of 1:4 (vertical:horizontal) or flatter to the bottom of the excavation. Full compensation for placing the material on a 1:4 slope, regardless of the number of times the material is required, and subsequent removing or reshaping of the material to the lines and grades shown on the plans shall be considered as included in the contract price paid for the materials involved and no additional compensation will be allowed therefor. No payment will be made for material placed in excess of that required for the structural section.

Soil excavated from the former Chevron gas station at the Douglas Boulevard exit of I-80 eastbound must be characterized to determine if it contains contaminants that will volatilize or leach into the ground.

The Sampling and Analysis Plan shall be prepared under the guidance of a registered professional, who is experienced in



site characterization. Sampling and analysis shall be based on guidelines in United States Environmental Protection Agency (USEPA), SW 846, "Test Methods for Evaluating Solid Waste, Volume II: Field Manual Physical/Chemical Methods". The contractor shall take samples and obtain analyses under the supervision and guidance of a registered professional, experienced in site characterization. Soil samples shall be obtained in as undisturbed state as possible for total petroleum hydrocarbons (TPH) as gasoline and diesel (TPHd), Environmental Protection Agency (EPA) Method 8260B for volatile organic compounds (VOC's) including fuel oxygenates such as oxygenates, Methyl Tertiary-Butyl Ether (MTBE) and lead (EPA method 6010).

Soil samples shall be obtained in an undisturbed state as possible. Soil samples shall be obtained using thin and/or thick walled sample barrels with stainless steel inserts during hand sampling. Thin-walled Shelby tube samples shall be obtained in accordance with ASTM D 1587-83. Samples shall be capped with teflon film or aluminum foil and plastic caps, sealed with the appropriate tape and preserved immediately at 4 degrees Celsius. Duct tape is not allowed for sealing sample tubes.

Analytical results shall be made available within 48 hours. Laboratory results shall be sent by facsimile or hand delivered to the Engineer as soon as they are available. A summary report of sampling protocols, chain of custody, analysis and laboratory data sheets shall be supplied to the Engineer within 30 days of completion of sampling.

The Engineer will make the final decision on classification or characterization of material after review of the test data. Five working days shall be allowed for review of test data. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications

If the material is found to be hazardous by concentration, it must be transported by a registered hauler to a state approved landfill such as Forward in Stockton California. Landfills have their own acceptance criteria which should be consulted. To dispose of the soil as non-hazardous material or as a road base will require a hazard assessment or a "LUFT" analysis to demonstrate that it poses no environmental hazard.

The contract lump sum price paid for hydrocarbon sampling and analysis shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in collecting and analyzing materials for TPHg, TPHd, VOCs, and SVOCs as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

At those locations exposed to public traffic where guard railings or barriers are to be constructed, reconstructed, or removed and replaced, the Contractor shall schedule operations so that at the end of each working day there shall be no post holes open nor shall there be any railing or barrier posts installed without the blocks and rail elements assembled and mounted thereon.

Attention is directed to "Move-In/Move-Out (Erosion Control)" of these special provisions regarding move-in / move-out of erosion control equipment.

Not less than 60 days prior to applying seeds, the Contractor shall furnish the Engineer a statement from the vendor that the order for the seed required for this contract has been received and accepted by the vendor. The statement from the vendor shall include the names and quantity of seed ordered and the anticipated date of delivery.

Attention is directed to Section 20-5.027B, "Wiring Plans and Diagrams," of the Standard Specifications regarding submittal of working drawings.

Attention is directed to "Irrigation Controller Enclosure Cabinet" of these special provisions regarding preinstalling irrigation components in the irrigation controller enclosure cabinet prior to field installation.

Installation of the Douglas Boulevard/I-80 Interchange Pumping Plant will be required for the completion of this contract. The contractor shall be responsible for temporary erosion control, as described elsewhere in these special provisions. Upon completion of the pumping plant work as described in Section 74, of the Standard Specifications, and these special provisions, the contractor shall be responsible for maintaining drainage pumping capacity of the drainage area, and maintenance of the pumping plant throughout the life of the contract. Section 7-1.15, Relief From Maintenance and Responsibility, of the Standard Specifications shall not apply to the Douglas Boulevard/I-80 Interchange Pumping Plant.

The total drainage capacity to be maintained shall not be less than 10,220 liters per minute at 13.40 meters of head. Maintenance of the pumping plant shall include, but not be limited to, providing necessary adjustments and repairs, and cleaning of the storage box, entrance bay, and the various sumps, for the proper operation of the Drainage Pumping Plant Equipment and Pumping Plant Electrical Equipment. Pumping capacity shall be maintained at the Contractor's option, by one of the following methods:

1. Staging the work such that the entire pumping plant is complete in place and capable of maintaining drainage pumping capacity. Attention is directed to Section 74-1.055, "Use of Pumps by Contractor Prior to Acceptance of Work", of the Standard Specifications.
2. Providing an auxiliary pumping system consisting of temporary drainage system, sump pumps and discharge piping.
3. A combination of the above two methods.

The Contractor shall submit his proposed method for maintaining drainage pumping capacity to the Engineer for approval.

#### **10-1.02 WATER POLLUTION CONTROL**

Water pollution control work shall conform to the provisions in Section 7-1.01G, "Water Pollution," of the Standard Specifications and these special provisions.

This project lies within the boundaries of the Central Valley Regional Quality Control Board (RWQCB).

The State Water Resources Control Board (SWRCB) has issued a permit to the Department which governs storm water and non-storm water discharges from its properties, facilities and activities. The Department's Permit is entitled: "Order No. 99-06-DWQ, NPDES No. CAS000003, National Pollutant Discharge Elimination System (NPDES) Permit, Storm Water Permit and Waste Discharge Requirements (WDRs) for the State of California, Department of Transportation Properties, Facilities, and Activities." Copies of the Department's Permit are available for review from the SWRCB, Storm Water Permit Unit, 1001 "I" Street, P.O. Box 1977, Sacramento, California 95812-1977, Telephone: (916) 341-5254, and may also be obtained from the SWRCB Internet website at: <http://www.swrcb.ca.gov/stormwtr/caltrans.html>.

The Department's Permit references and incorporates by reference the current Statewide General Permit issued by the SWRCB entitled "Order No. 99-08-DWQ, National Pollutant Discharge Elimination System (NPDES) General Permit No. CAS000002, Waste Discharge Requirements (WDRs) for Discharges of Storm Water Associated with Construction Activity," which regulates discharges of storm water and non-storm water from construction activities disturbing 0.4-hectare or more of soil in a common plan of development. Sampling and analysis requirements as specified in SWRCB Resolution No. 2001-46 are added to the Statewide General Permit. Copies of the Statewide General Permit and modifications thereto are available for review from the SWRCB, Storm Water Permit Unit, 1001 "I" Street, P.O. Box 1977, Sacramento, California 95812-1977, Telephone: (916) 341-5254 and may also be obtained from the SWRCB Internet website at: <http://www.swrcb.ca.gov/stormwtr/construction.html>.

The Central Valley RWQCB has issued a permit which governs storm water and non-storm water discharges resulting from construction activities in the project area. The NPDES permit that regulate this project, as referenced above, are hereafter collectively referred to as the "Permits."

This project shall conform to the Permits and modifications thereto. The Contractor shall maintain copies of the Permits at the project site and shall make the Permits available during construction.

The Permits require the preparation of a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP shall be prepared in conformance with the requirements of the Permits, the Department's "Storm Water Pollution Prevention Plan (SWPPP) and Water Pollution Control Program (WPCP) Preparation Manual," and the Department's "Construction Site Best Management Practices (BMPs) Manual," including addenda to those permits and manuals issued up to and including the date of advertisement of the project. These manuals are hereinafter referred to, respectively, as the "Preparation Manual" and the "Construction Site BMPs Manual," and collectively, as the "Manuals." Copies of the Manuals may be obtained from the Department of Transportation, Material Operations Branch, Publication Distribution Unit, 1900 Royal Oaks Drive, Sacramento, California 95815, Telephone: (916) 445-3520, and may also be obtained from the Department's Internet website at: <http://www.dot.ca.gov/hq/construc/stormwater/stormwater1.htm>.

The Contractor shall know and fully comply with applicable provisions of the Permits and all modifications thereto, the Manuals, and Federal, State, and local regulations and requirements that govern the Contractor's operations and storm water and non-storm water discharges from both the project site and areas of disturbance outside the project limits during construction. Attention is directed to Sections 7-1.01, "Laws to be Observed," and 7-1.12, "Indemnification and Insurance," of the Standard Specifications.

The Permits shall apply to storm water and certain permitted non-storm water discharges from areas outside the project site which are directly related to construction activities for this contract including, but not limited to, asphalt batch plants, material borrow areas, concrete plants, staging areas, storage yards and access roads. The Contractor shall comply with the Permits and the Manuals for those areas and shall implement, inspect and maintain the required water pollution control practices. The Engineer shall be allowed full access to these areas during construction to assure Contractor's proper implementation of water pollution control practices. Installing, inspecting and maintaining water pollution control practices on areas outside the highway right of way not specifically arranged and provided for by the Department for the execution of this contract, will not be paid for.

The Contractor shall be responsible for penalties assessed or levied on the Contractor or the Department as a result of the Contractor's failure to comply with the provisions in this section "Water Pollution Control" including, but not limited to, compliance with the applicable provisions of the Permits, the Manuals, and Federal, State and local regulations and requirements as set forth therein.

Penalties as used in this section, "Water Pollution Control," shall include fines, penalties and damages, whether proposed, assessed, or levied against the Department or the Contractor, including those levied under the Federal Clean Water

Act and the State Porter-Cologne Water Quality Control Act, by governmental agencies or as a result of citizen suits. Penalties shall also include payments made or costs incurred in settlement for alleged violations of the Permits, the Manuals, or applicable laws, regulations, or requirements. Costs incurred could include sums spent instead of penalties, in mitigation or to remediate or correct violations.

### **RETENTION OF FUNDS**

Notwithstanding any other remedies authorized by law, the Department may retain money due the Contractor under the contract, in an amount determined by the Department, up to and including the entire amount of Penalties proposed, assessed, or levied as a result of the Contractor's violation of the Permits, the Manuals, or Federal or State law, regulations or requirements. Funds may be retained by the Department until final disposition has been made as to the Penalties. The Contractor shall remain liable for the full amount of Penalties until such time as they are finally resolved with the entity seeking the Penalties.

Retention of funds for failure to conform to the provisions in this section, "Water Pollution Control," shall be in addition to the other retention amounts required by the contract. The amounts retained for the Contractor's failure to conform to provisions in this section will be released for payment on the next monthly estimate for partial payment following the date when an approved SWPPP has been implemented and maintained, and when water pollution has been adequately controlled, as determined by the Engineer.

When a regulatory agency identifies a failure to comply with the Permits and modifications thereto, the Manuals, or other Federal, State or local requirements, the Department may retain money due the Contractor, subject to the following:

- A. The Department will give the Contractor 30 days notice of the Department's intention to retain funds from partial payments which may become due to the Contractor prior to acceptance of the contract. Retention of funds from payments made after acceptance of the contract may be made without prior notice to the Contractor.
- B. No retention of additional amounts out of partial payments will be made if the amount to be retained does not exceed the amount being withheld from partial payments pursuant to Section 9-1.06, "Partial Payments," of the Standard Specifications.
- C. If the Department has retained funds, and it is subsequently determined that the State is not subject to the entire amount of the Costs and Liabilities assessed or proposed in connection with the matter for which the retention was made, the Department shall be liable for interest on the amount retained for the period of the retention. The interest rate payable shall be 6 percent per annum.

During the first estimate period that the Contractor fails to conform to the provisions in this section, "Water Pollution Control," the Department may retain an amount equal to 25 percent of the estimated value of the contract work performed.

The Contractor shall notify the Engineer immediately upon request from the regulatory agencies to enter, inspect, sample, monitor, or otherwise access the project site or the Contractor's records pertaining to water pollution control work. The Contractor and the Department shall provide copies of correspondence, notices of violation, enforcement actions or proposed fines by regulatory agencies to the requesting regulatory agency.

### **STORM WATER POLLUTION PREVENTION PLAN PREPARATION, APPROVAL AND AMENDMENTS**

As part of the water pollution control work, a Storm Water Pollution Prevention Plan (SWPPP) is required for this contract. The SWPPP shall conform to the provisions in Section 7-1.01G, "Water Pollution," of the Standard Specifications, the requirements in the Manuals, the requirements of the Permits, and these special provisions. Upon the Engineer's approval of the SWPPP, the SWPPP shall be considered to fulfill the provisions in Section 7-1.01G, "Water Pollution," of the Standard Specifications for development and submittal of a Water Pollution Control Program.

No work having potential to cause water pollution, shall be performed until the SWPPP has been approved by the Engineer. Approval shall not constitute a finding that the SWPPP complies with applicable requirements of the Permits, the Manuals and applicable Federal, State and local laws, regulations, and requirements.

The Contractor shall designate a Water Pollution Control Manager. The Water Pollution Control Manager shall be responsible for the preparation of the SWPPP and required modifications or amendments, and shall be responsible for the implementation and adequate functioning of the various water pollution control practices employed. The Contractor may designate different Water Pollution Control Managers to prepare the SWPPP and to implement the water pollution control practices. The Water Pollution Control Managers shall serve as the primary contact for issues related to the SWPPP or its implementation. The Contractor shall submit to the Engineer a statement of qualifications, describing the training, previous work history and expertise of the individual selected by the Contractor to serve as Water Pollution Control Manager. The Water Pollution Control Manager shall have a minimum of 24 hours of formal storm water management training or certification as a Certified Professional in Erosion and Sediment Control (CPESC). The Engineer will reject the Contractor's submission of a Water Pollution Control Manager if the submitted qualifications are deemed to be inadequate.

The SWPPP shall apply to the areas within and those outside of the highway right of way that are directly related to construction operations including, but not limited to, asphalt batch plants, material borrow areas, concrete plants, staging areas, storage yards, and access roads.

The SWPPP shall incorporate water pollution control practices in the following categories:

- A. Soil stabilization.
- B. Sediment control.
- C. Wind erosion control.
- D. Tracking control.
- E. Non-storm water management.
- F. Waste management and materials pollution control.

The SWPPP shall include, but not be limited to, the items described in the Manuals, Permits and related information contained in the contract documents. The SWPPP shall also include a copy of the following: NOTIFICATION OF CONSTRUCTION

The Contractor shall develop and include in the SWPPP the Sampling and Analysis Plan(s) as required by the Permits, and modifications thereto, and as required in "Sampling and Analytical Requirements" of this section.

The Contractor shall develop a Water Pollution Control Schedule that describes the timing of grading or other work activities that could affect water pollution. The Water Pollution Control Schedule shall be updated by the Contractor to reflect changes in the Contractor's operations that would affect the necessary implementation of water pollution control practices.

The Contractor shall complete the "Construction Site BMPs Consideration Checklist" presented in the Preparation Manual and shall incorporate water pollution control practices into the SWPPP. Water pollution control practices include the "Minimum Requirements" and other Contractor-selected water pollution control practices from the "Construction Site BMPs Consideration Checklist" and the "Project-Specific Minimum Requirements" identified in the Water Pollution Control Cost Break-Down of this section.

Within 20 working days after the approval of the contract, the Contractor shall submit 3 copies of the draft SWPPP to the Engineer. The Engineer will have 10 working days to review the SWPPP. If revisions are required, as determined by the Engineer, the Contractor shall revise and resubmit the SWPPP within 10 working days of receipt of the Engineer's comments. The Engineer will have 5 working days to review the revisions. Upon the Engineer's approval of the SWPPP, 4 approved copies of the SWPPP, incorporating the required changes, shall be submitted to the Engineer. In order to allow construction activities to proceed, the Engineer may conditionally approve the SWPPP while minor revisions are being completed. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for resulting losses, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

The Contractor shall prepare an amendment to the SWPPP when there is a change in construction activities or operations which may affect the discharge of pollutants to surface waters, ground waters, municipal storm drain systems, or when the Contractor's activities or operations violate a condition of the Permits, or when directed by the Engineer. Amendments shall identify additional water pollution control practices or revised operations, including those areas or operations not identified in the initially approved SWPPP. Amendments to the SWPPP shall be prepared and submitted for review and approval within a time approved by the Engineer, but in no case longer than the time specified for the initial submittal and review of the SWPPP. At a minimum, the SWPPP shall be amended annually and submitted to the Engineer 25 days prior to the defined rainy season.

The Contractor shall keep one copy of the approved SWPPP and approved amendments at the project site. The SWPPP shall be made available upon request by a representative of the Regional Water Quality Control Board, State Water Resources Control Board, United States Environmental Protection Agency, or the local storm water management agency. Requests by the public shall be directed to the Engineer.

#### **COST BREAK-DOWN**

The Contractor shall include a Water Pollution Control Cost Break-Down in the SWPPP which itemizes the contract lump sum for water pollution control work. The Contractor shall use the Water Pollution Control Cost Break-Down provided in this section as the basis for the cost break-down submitted with the SWPPP. The Contractor shall use the Water Pollution Control Cost Break-Down to identify items, quantities and values for water pollution control work, excluding Temporary Water Pollution Control Practices for which there are separate bid items. The Contractor shall be responsible for the accuracy of the quantities and values used in the cost break-down submitted with the SWPPP. Partial payment for the item of water pollution control will not be made until the Water Pollution Control Cost Break-Down is approved by the

Engineer.

Attention is directed to "Time-Related Overhead" of these special provisions regarding compensation for time-related overhead.

Line items indicated in the Water Pollution Control Cost Break-Down in this section with a specified Estimated Quantity shall be considered "Project-Specific Minimum Requirements." The Contractor shall incorporate Project-Specific Minimum Requirements with Contractor-designated quantities and values into the Water Pollution Control Cost Break-Down submitted with the SWPPP.

Line items indicated in the Water Pollution Control Cost Break-Down in this section without a specified Estimated Quantity shall be considered by the Contractor for selection to meet the applicable "Minimum Requirements" as defined in the Manuals, or for other water pollution control work as identified in the "Construction Site BMPs Consideration Checklist" presented in the Preparation Manual. In the Water Pollution Control Cost Break-Down submitted with the SWPPP, the Contractor shall list only those water pollution control practices selected for the project, including quantities and values required to complete the work for those items.

The sum of the amounts for the items of work listed in the Water Pollution Control Cost Break-Down shall be equal to the contract lump sum price bid for water pollution control. Overhead and profit, except for time-related overhead, shall be included in the individual items listed in the cost break-down.

### WATER POLLUTION CONTROL COST BREAK-DOWN

**Contract No. 03-375604**

ITEM	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITY	VALUE	AMOUNT
SS-3	Hydraulic Mulch	M2			
SS-4	Hydroseeding	M2			
SS-5	Soil Binders	M2			
SS-6	Straw Mulch	M2			
SS-7	Geotextiles, Plastic Covers & Erosion Control Blankets/Mats	M2			
SS-8	Wood Mulching	M2			
SS-9	Earth Dikes/Drainage Swales & Lined Ditches	M			
SS-10	Outlet Protection/Velocity Dissipation Devices	EA			
SS-11	Slope Drains	EA			
SS-12	Streambank Stabilization	LS			
SC-1	Silt Fence	M			
SC-2	Sediment/Desilting Basin	EA			
SC-3	Sediment Trap	EA			
SC-4	Check Dam	EA			
SC-5	Fiber Rolls	M			
SC-6	Gravel Bag Berm	M			
SC-7	Street Sweeping and Vacuuming	LS			
SC-8	Sandbag Barrier	M			
SC-9	Straw Bale Barrier	M			

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ITEM	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITY	VALUE	AMOUNT
SC-10	Storm Drain Inlet Protection	EA			
WE-1	Wind Erosion Control	LS			
TC-1	Stabilized Construction Entrance/Exit	EA			
TC-2	Stabilized Construction Roadway	EA			
TC-3	Entrance/Outlet Tire Wash	EA			
NS-1	Water Conservation Practices	LS			
NS-2	Dewatering Operations	EA			
NS-3	Paving and Grinding Operations	LS			
NS-4	Temporary Stream Crossing	EA			
NS-5	Clear Water Diversion	EA			
NS-6	Illicit Connection/Illegal Discharge Detection and Reporting	LS			
NS-7	Potable Water/Irrigation	LS			
NS-8	Vehicle and Equipment Cleaning	LS			
NS-9	Vehicle and Equipment Fueling	LS			
NS-10	Vehicle and Equipment Maintenance	LS			
NS-11	Pile Driving Operations	LS			
NS-12	Concrete Curing	LS			
NS-13	Material and Equipment Use over Water	LS			
NS-14	Concrete Finishing	LS			
NS-15	Structure Demolition/Removal Over or Adjacent to Water	LS			
WM-1	Material Delivery and Storage	LS			
WM-2	Material Use	LS			
WM-3	Stockpile Management	LS			
WM-4	Spill Prevention and Control	LS			
WM-5	Solid Waste Management	LS			
WM-6	Hazardous Waste Management	LS			
WM-7	Contaminated Soil Management	LS			
WM-8	Concrete Waste Management	LS			
WM-9	Sanitary/Septic Waste Management	LS			
WM-10	Liquid Waste Management	LS			

ITEM	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITY	VALUE	AMOUNT
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**TOTAL** \_\_\_\_\_

Adjustments in the items of work and quantities listed in the approved cost break-down shall be made when required to address amendments to the SWPPP, except when the adjusted items are paid for as extra work.

No adjustment in compensation will be made to the contract lump sum price paid for water pollution control due to differences between the quantities shown in the approved cost break-down and the quantities required to complete the work as shown on the approved SWPPP. No adjustment in compensation will be made for ordered changes to correct SWPPP work resulting from the Contractor's own operations or from the Contractor's negligence.

The approved cost break-down will be used to determine partial payments during the progress of the work and as the basis for calculating the adjustment in compensation for the item of water pollution control due to increases or decreases of quantities ordered by the Engineer. When an ordered change increases or decreases the quantities of an approved cost break-down item, the adjustment in compensation will be determined in the same manner specified for increases and decreases in the quantity of a contract item of work in conformance with the provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications. If an ordered change requires a new item which is not on the approved cost break-down, the adjustment in compensation will be determined in the same manner specified for extra work in conformance with Section 4-1.03D, "Extra Work," of the Standard Specifications.

If requested by the Contractor and approved by the Engineer, changes to the water pollution control practices listed in the approved cost break-down, including addition of new water pollution control practices, will be allowed. Changes shall be included in the approved amendment of the SWPPP. If the requested changes result in a net cost increase to the lump sum price for water pollution control, an adjustment in compensation will be made without change to the water pollution control item. The net cost increase to the water pollution control item will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

### **SWPPP IMPLEMENTATION**

Unless otherwise specified, upon approval of the SWPPP, the Contractor shall be responsible throughout the duration of the project for installing, constructing, inspecting, maintaining, removing, and disposing of the water pollution control practices specified in the SWPPP and in the amendments. Unless otherwise directed by the Engineer, the Contractor's responsibility for SWPPP implementation shall continue throughout temporary suspensions of work ordered in conformance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications. Requirements for installation, construction, inspection, maintenance, removal, and disposal of water pollution control practices shall conform to the requirements in the Manuals and these special provisions.

If the Contractor or the Engineer identifies a deficiency in the implementation of the approved SWPPP or amendments, the deficiency shall be corrected immediately unless requested by the Contractor and approved by the Engineer in writing, but shall be corrected prior to the onset of precipitation. If the Contractor fails to correct the identified deficiency by the date agreed or prior to the onset of precipitation, the project shall be in nonconformance with this section, "Water Pollution Control." Attention is directed to Section 5-1.01, "Authority of Engineer," of the Standard Specifications, and to "Retention of Funds" of this section for possible nonconformance penalties.

If the Contractor fails to conform to the provisions of this section, "Water Pollution Control," the Engineer may order the suspension of construction operations until the project complies with the requirements of this section.

Implementation of water pollution control practices may vary by season. The Construction Site BMPs Manual and these special provisions shall be followed for control practice selection of year-round, rainy season and non-rainy season water pollution control practices.

### **Year-Round Implementation Requirements**

The Contractor shall have a year-round program for implementing, inspecting and maintaining water pollution control practices for wind erosion control, tracking control, non-storm water management, and waste management and materials pollution control.

The National Weather Service weather forecast shall be monitored and used by the Contractor on a daily basis. An alternative weather forecast proposed by the Contractor may be used if approved by the Engineer. If precipitation is predicted, the necessary water pollution control practices shall be deployed prior to the onset of the precipitation.

Disturbed soil areas shall be considered active whenever the soil disturbing activities have occurred, continue to occur or will occur during the ensuing 21 days. Non-active areas shall be protected as prescribed in the Construction Site BMPs

Manual within 14 days of cessation of soil disturbing activities or prior to the onset of precipitation, whichever occurs first.

In order to provide effective erosion control, the Contractor may be directed by the Engineer to apply permanent erosion control in small or multiple units. The Contractor's attention is directed to "Erosion Control (Type D)" and "Move-In/Move-Out (Erosion Control)" of these special provisions.

### **Rainy Season Implementation Requirements**

Soil stabilization and sediment control practices shall be provided throughout the rainy season, defined as between August 1 and October 1, and between November 1 and May 1.

Soil stabilization and sediment control practices shall be provided throughout the rainy season, defined as between October 15 and April 15.

An implementation schedule of required soil stabilization and sediment control practices for disturbed soil areas shall be completed no later than 20 days prior to the beginning of each rainy season. The implementation schedule shall identify the soil stabilization and sediment control practices and the dates when the implementation will be 25 percent, 50 percent and 100 percent complete, respectively. For construction activities beginning during the rainy season, the Contractor shall implement applicable soil stabilization and sediment control practices.

Throughout the defined rainy season, the active disturbed soil area of the project site shall be not more than 0.4 hectares. The Engineer may approve, on a case-by-case basis, expansions of the active disturbed soil area limit. Soil stabilization and sediment control materials shall be maintained on site sufficient to protect disturbed soil areas. A detailed plan for the mobilization of sufficient labor and equipment shall be maintained to deploy the water pollution control practices required to protect disturbed soil areas prior to the onset of precipitation.

### **Non-Rainy Season Implementation Requirements**

The non-rainy season shall be defined as days outside the defined rainy season. The Contractor's attention is directed to the Construction Site BMPs Manual for soil stabilization and sediment control implementation requirements on disturbed soil areas during the non-rainy season. Disturbed soil areas within the project shall be protected in conformance with the requirements in the Construction Site BMPs Manual with an effective combination of soil stabilization and sediment control.

## **MAINTENANCE**

To ensure the proper implementation and functioning of water pollution control practices, the Contractor shall regularly inspect and maintain the construction site for the water pollution control practices identified in the SWPPP. The construction site shall be inspected by the Contractor as follows:

- A. Prior to a forecast storm.
- B. After a precipitation event which causes site runoff.
- C. At 24 hour intervals during extended precipitation events.
- D. Routinely, a minimum of once every two weeks outside of the defined rainy season.
- E. Routinely, a minimum of once every week during the defined rainy season.

The Contractor shall use the Storm Water Quality Construction Site Inspection Checklist provided in the Preparation Manual or an alternative inspection checklist provided by the Engineer. One copy of each site inspection record shall be submitted to the Engineer within 24 hours of completing the inspection.

## **REPORTING REQUIREMENTS**

### **Report of Discharges, Notices or Orders**

If the Contractor identifies discharges into surface waters or drainage systems in a manner causing, or potentially causing, a condition of pollution, or if the project receives a written notice or order from a regulatory agency, the Contractor shall immediately inform the Engineer. The Contractor shall submit a written report to the Engineer within 7 days of the discharge event, notice or order. The report shall include the following information:

- A. The date, time, location, nature of the operation, and type of discharge, including the cause or nature of the notice or order.
- B. The water pollution control practices deployed before the discharge event, or prior to receiving the notice or order.
- C. The date of deployment and type of water pollution control practices deployed after the discharge event, or after receiving the notice or order, including additional measures installed or planned to reduce or prevent reoccurrence.
- D. An implementation and maintenance schedule for affected water pollution control practices.



### **Report of First-Time Non-Storm Water Discharge**

The Contractor shall notify the Engineer at least 3 days in advance of first-time non-storm water discharge events, excluding exempted discharges. The Contractor shall notify the Engineer of the operations causing non-storm water discharges and shall obtain field approval for first-time non-storm water discharges. Non-storm water discharges shall be monitored at first-time occurrences and routinely thereafter.

### **Annual Certifications**

By June 15 of each year, the Contractor shall complete and submit an Annual Certification of Compliance, as contained in the Preparation Manual, to the Engineer.

### **Non-Visible Pollutants**

The project has the potential to discharge non-visible pollutants in storm water from the construction site. The project SWPPP shall contain a Sampling and Analysis Plan (SAP) that describes the sampling and analysis strategy and schedule to be implemented on the project for monitoring non-visible pollutants in conformance with this section.

The SAP shall identify potential non-visible pollutants that are known or should be known to occur on the construction site associated with the following: (1) construction materials, wastes or operations; (2) known existing contamination due to historical site usage; or (3) application of soil amendments, including soil stabilization products, with the potential to alter pH or contribute toxic pollutants to storm water. Planned material and waste storage areas, locations of known existing contamination, and areas planned for application of soil amendments shall be shown on the SWPPP Water Pollution Control Drawings.

The SAP shall identify a sampling schedule for collecting a sample down gradient from the applicable non-visible pollutant source and a sufficiently large uncontaminated control sample during the first two hours of discharge from rain events during daylight hours which result in a sufficient discharge for sample collection. If run-on occurs onto the non-visible pollutant source, a run-on sample that is immediately down gradient of the run-on to the Department's right of way shall be collected. A minimum of 72 hours of dry weather shall occur between rain events to distinguish separate rain events.

The SAP shall state that water quality sampling will be triggered when any of the following conditions are observed during the required storm water inspections conducted before or during a rain event:

- A. Materials or wastes containing potential non-visible pollutants are not stored under watertight conditions.
- B. Materials or wastes containing potential non-visible pollutants are stored under watertight conditions, but (1) a breach, leakage, malfunction, or spill is observed; and (2) the leak or spill has not been cleaned up prior to the rain event; and (3) there is the potential for discharge of non-visible pollutants to surface waters or drainage system.
- C. Construction activities, such as application of fertilizer, pesticide, herbicide, methyl methacrylate concrete sealant, or non-pigmented curing compound have occurred during a rain event or within 24 hours preceding a rain event, and there is the potential for discharge of pollutants to surface waters or drainage system.
- D. Soil amendments, including soil stabilization products, with the potential to alter pH levels or contribute toxic pollutants to storm water runoff have been applied, and there is the potential for discharge of pollutants to surface waters or drainage system (unless independent test data are available that demonstrate acceptable concentration levels of non-visible pollutants in the soil amendment).
- E. Storm water runoff from an area contaminated by historical usage of the site is observed to combine with storm water, and there is the potential for discharge of pollutants to surface waters or drainage system.

The SAP shall identify sampling locations for collecting down gradient and control samples, and the rationale for their selection. The control sampling location shall be selected where the sample does not come into contact with materials, wastes or areas associated with potential non-visible pollutants or disturbed soil areas. Sampling locations shall be shown on the SWPPP Water Pollution Control Drawings. Only trained personnel shall collect water quality samples and be identified in the SAP. Qualifications of designated sampling personnel shall describe training and experience, and shall be included in the SWPPP. The SAP shall state monitoring preparation, sample collection procedures, quality assurance/quality control, sample labeling procedures, sample collection documentation, sample shipping and chain of custody procedures, sample numbering system, and reference the construction site health and safety plan.

The SAP shall identify the analytical method to be used for analyzing down gradient and control samples for potential non-visible pollutants on the project. For samples analyzed in the field by sampling personnel, collection, analysis, and equipment calibration shall be in conformance with the Manufacturer's specifications. For samples that will be analyzed by a laboratory, sampling, preservation, and analysis shall be performed by a State-certified laboratory in conformance with 40 CFR 136. The SAP shall identify the specific State-certified laboratory, sample containers, preservation requirements, holding times, and analysis method to be used. A list of State-certified laboratories that are approved by the Department is

available at the following internet site: [http://www.dhs.ca.gov/ps/ls/elap/html/lablist\\_county.htm](http://www.dhs.ca.gov/ps/ls/elap/html/lablist_county.htm).

### **Analytical Results and Evaluation**

The Contractor shall submit a hard copy and electronic copy of water quality analytical results and quality assurance/quality control data to the Engineer within 5 days of sampling for field analyses and within 30 days for laboratory analyses. Analytical results shall be accompanied by an evaluation from the Contractor to determine if down gradient samples show elevated levels of the tested parameter relative to levels in the control sample. If down gradient or downstream samples, as applicable, show increased levels, the Contractor will assess the BMPs, site conditions, and surrounding influences to determine the probable cause for the increase. As determined by the assessment, the Contractor will repair or modify BMPs to address increases and amend the SWPPP as necessary. Electronic results (in one of the following file formats: .xls, .txt, .csv, .dbf, or .mdb) shall have at a minimum the following information: sample identification number, contract number, constituent, reported value, method reference, method detection limit, and reported detection limit. The Contractor shall document sample collection during rain events.

Water quality sampling documentation and analytical results shall be maintained with the SWPPP on the project site until a Notice of Completion has been submitted and approved.

If construction activities or knowledge of site conditions change, such that discharges or sampling locations change, the Contractor shall amend the SAP in conformance with this section, "Water Pollution Control."

### **PAYMENT**

The contract lump sum price paid for prepare storm water pollution prevention plan shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals for doing all the work involved in developing, preparing, obtaining approval of, revising, and amending the SWPPP, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Attention is directed to Section 9-1.06, "Partial Payments," and Section 9-1.07, "Payment After Acceptance," of the Standard Specifications. Payments for prepare storm water pollution prevention plan will be made as follows:

- A. After the SWPPP has been approved by the Engineer, 75 percent of the contract item price for prepare storm water pollution prevention plan will be included in the monthly partial payment estimate.
- B. After acceptance of the contract in conformance with the provisions in Section 7-1.17, "Acceptance of Contract," of the Standard Specifications, payment for the remaining 25 percent of the contract item price for prepare storm water pollution prevention plan will be made in conformance with the provisions in Section 9-1.07.

The contract lump sum price paid for water pollution control shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing, constructing, removing, and disposing of water pollution control practices, including non-storm water management, and waste management and materials pollution water pollution control practices, except those for which there is a contract item of work as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Storm water sampling and analysis will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications. No payment will be made for the preparation, collection, analysis, and reporting of storm water samples required where appropriate BMPs are not implemented prior to a rain event, or if a failure of a BMP is not corrected prior to a rain event.

For items identified on the approved Water Pollution Control Cost Break-Down, the cost of maintaining the temporary water pollution control practices shall be divided equally by the State and the Contractor as follows:

#### **Soil Stabilization**

Temporary water pollution control practices except:

SS-1 Scheduling

SS-2 Preservation of Existing Vegetation

#### **Sediment Control**

Temporary water pollution control practices except:

SC-7 Street Sweeping and Vacuuming

#### **Wind Erosion Control**

No sharing of maintenance costs will be allowed.

### **Tracking Control**

TC-1 Stabilized Construction Entrance/Exit.

### **Non-Storm Water Management**

No sharing of maintenance costs will be allowed.

### **Waste Management & Materials Pollution Control**

No sharing of maintenance costs will be allowed.

The division of cost will be made by determining the cost of maintaining water pollution control practices in conformance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications and paying to the Contractor one-half of that cost. Cleanup, repair, removal, disposal, improper installation, and replacement of water pollution control practices damaged by the Contractor's negligence, shall not be considered as included in the cost for performing maintenance.

The provisions for sharing maintenance costs shall not relieve the Contractor from the responsibility for providing appropriate maintenance on items with no shared maintenance costs.

Full compensation for non-shared maintenance costs of water pollution control practices, as specified in this section, "Water Pollution Control," shall be considered as included in the contract lump sum price paid for water pollution control and no additional compensation will be allowed therefor.

## **10-1.03 PRESERVATION OF PROPERTY**

Attention is directed to Section 7-1.11, "Preservation of Property," of the Standard Specifications and these special provisions.

Existing trees, shrubs and other plants, that are not to be removed as shown on the plans or specified in these special provisions, and are injured or damaged by reason of the Contractor's operations, shall be replaced by the Contractor. The minimum size of tree replacement shall be No. 15 container. Replacement ground cover plants shall be from flats and shall be planted 300 mm on center. Replacement of Carpobrotus ground cover plants shall be from cuttings and shall be planted 300 mm on center. Replacement planting shall conform to the requirements in Section 20-4.07, "Replacement," of the Standard Specifications. The Contractor shall water replacement plants in conformance with the provisions in Section 20-4.06, "Watering," of the Standard Specifications.

Damaged or injured plants shall be removed and disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13 of the Standard Specifications. At the option of the Contractor, removed trees and shrubs may be reduced to chips. The chipped material shall be spread within the highway right of way at locations designated by the Engineer.

Replacement planting of injured or damaged trees, shrubs and other plants shall be completed not less than 20 working days prior to acceptance of the contract. Replacement plants shall be watered as necessary to maintain the plants in a healthy condition.

## **10-1.04 TEMPORARY BRIDGE**

This work shall consist of designing, constructing, monitoring, maintaining and removing temporary bridges or bridging required to maintain traffic during construction of the tunnel. Temporary bridges shall conform with provisions in Section 49, "Piling," Section 51, "Concrete Structures," Section 52, "Reinforcement," and Section 55, "Steel Structures," of the Standard Specifications and these special provisions.

The Contractor shall provide sufficient width of temporary bridge to safely carry traffic over the tunnel construction for the number of lanes specified in the Lane Closure Charts provided in these special provisions. Temporary railing (Type K) shall be provided between the traffic and the edge of temporary bridge where the edge of traffic lane is less than 3.0 meters from the edge the temporary bridge, measured normal to the direction of traffic. The temporary bridge shall be of sufficient length to clear span over the tunnel without intermediate supports and over the temporary bridge foundations. Attention is directed to Sections 7-1.08, "Public Convenience," 7-1.09, "Public Safety," and 12, "Construction Area Traffic Control Devices," of the Standard Specifications and "Maintaining Traffic" of these special provisions.

## **DESIGN AND WORKING DRAWINGS**

In conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications the Contractor shall submit to the Engineer, for approval, drawings for temporary bridges or bridging to be used to maintain traffic during construction of the tunnel.

The working drawings shall include descriptions and values of all loads, including live loads as shown on the Contract

plans and construction equipment, descriptions of equipment to be used, and complete details and calculations for supporting all loads imposed. The calculations shall demonstrate the overall stability of the structure and the structural capacity of the individual elements of the system during each stage of the erection and removal operations. Working drawings for any part of the temporary bridge shall include, but not be limited to, connection details, shop details, erection and removal plans, roadway approach details and equipment lists.

Working drawings and design calculations for temporary bridges or bridging shall be signed by an Engineer who is licensed as a Civil Engineer in the State of California. In addition, the Contractor will be required to provide an "Independent Design Check" again signed by an independent engineer who is registered as a Civil Engineer in the State of California. Five (5) copies of working drawings and 2 copies of design calculations and stress sheets shall be furnished. The construction of the temporary bridge shall not start until the Engineer has reviewed and approved the drawings for the temporary bridge. The Contractor shall allow 8 weeks after complete drawings and all support data are submitted for the review of the temporary bridge drawings.

In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

The design load for temporary bridge or bridging shall include HS20-44 and alternative truck loading and shall conform with AASHTO Standard Specifications for Highway Bridges dated 2000 with interims and revisions by Caltrans.

When footing type foundations are to be used, the Contractor shall determine the bearing value of the soil and shall show the values assumed in the design of the temporary supports on the temporary support drawings. Anticipated temporary support foundation settlement shall be shown on the temporary support drawings. Temporary support footings shall be designed to carry the load imposed upon them without exceeding the estimated soil bearing values and anticipated settlements.

When temporary bridge or bridging is supported on cofferdam piles, shoring piles or additional temporary piles, the piles shall be driven and the actual bearing value assessed in conformance with the provisions in Section 49, "Piling," of the Standard Specifications.

Welding of steel members for temporary bridges or bridging, connections to cofferdam or any other support system shall conform to details shown on the Contractor's working drawings, provisions in Section 55, "Steel Structures" of the Standard Specifications and these special provisions.

Manufactured assemblies shall conform to the provisions in Section 51-1.06A(2), "Design Stresses, Loadings, and Deflections," of the Standard Specifications and these special provisions.

## **CONSTRUCTION**

Temporary bridge construction shall conform to the provisions for falsework in the first paragraph of Section 51-1.06B, "Falsework Construction," of the Standard Specifications.

Welding, welder qualification, and inspection of welding shall conform to the requirements of ANSI/AASHTO/AWS D1.5.

Product manufacturers will be required to produce quality control documentation for all materials incorporated into the work. All temporary bridges will require material nondestructive evaluation (NDE) including inspection of welds and materials by Caltrans NDE specialist inspectors and material testing staff. Testing will conform to requirements of the quality control plan and shop drawings. Welding shall conform to AWS D1.5. Tracking identification shall be required on all primary load carrying members for evaluation of fatigue or cyclic loading patterns.

Temporary roadway approaches to temporary bridge shall provide a reasonably smooth and even surface satisfactory for safe use by public traffic.

When temporary bridge is no longer needed to bridge the gap, the bridge span shall be removed entirely and the temporary bridge foundation removed to a depth of 0.9 m below finished grade, but not lower than the top of tunnel.

## **PAYMENT**

The contract lump sum price paid for temporary bridge shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in designing, constructing, maintaining and removing the temporary bridge, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## **10-1.05 COOPERATION**

Attention is directed to Section 7-1.14, "Cooperation," and Section 8-1.10, "Utility and Non-Highway Facilities," of the Standard Specifications and these special provisions.

It is anticipated that work by another contractor (Contract No.03-3546U4), an HOV project on Route 80 from Madison

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to Riverside (KP 14.6 to KP 28.9) may be in progress adjacent to or within the limits of this project during progress of the work on this contract.

#### **10-1.06 PROGRESS SCHEDULE (CRITICAL PATH METHOD)**

The Contractor shall submit to the Engineer practicable critical path method (CPM) progress schedules in conformance with these special provisions. Whenever the term "schedule" is used in this section it shall mean CPM progress schedule.

Attention is directed to "Payments" of Section 5 of these special provisions.

The provisions in Section 8-1.04, "Progress Schedule," of the Standard Specifications shall not apply.

#### **DEFINITIONS**

The following definitions shall apply to this section:

- A. **ACTIVITY.**—A task, event or other project element on a schedule that contributes to completing the project. Activities have a description, start date, finish date, duration and one or more logic ties.
- B. **BASELINE SCHEDULE.**—The initial schedule representing the Contractor's work plan on the first working day of the project.
- C. **CONTRACT COMPLETION DATE.**—The current extended date for completion of the contract shown on the weekly statement of working days furnished by the Engineer in conformance with the provisions in Section 8-1.06, "Time of Completion," of the Standard Specifications.
- D. **CRITICAL PATH.**—The longest continuous chain of activities for the project that has the least amount of total float of all chains. In general, a delay on the critical path will extend the scheduled completion date.
- E. **CRITICAL PATH METHOD (CPM).**—A network based planning technique using activity durations and the relationships between activities to mathematically calculate a schedule for the entire project.
- F. **DATA DATE.**—The day after the date through which a schedule is current. Everything occurring earlier than the data date is "as-built" and everything on or after the data date is "planned."
- G. **EARLY COMPLETION TIME.**—The difference in time between an early scheduled completion date and the contract completion date.
- H. **FLOAT.**—The difference between the earliest and latest allowable start or finish times for an activity.
- I. **MILESTONE.**—An event activity that has zero duration and is typically used to represent the beginning or end of a certain stage of the project.
- J. **NARRATIVE REPORT.**—A document submitted with each schedule that discusses topics related to project progress and scheduling.
- K. **NEAR CRITICAL PATH.**—A chain of activities with total float exceeding that of the critical path but having no more than 10 working days of total float.
- L. **SCHEDULED COMPLETION DATE.**—The planned project finish date shown on the current accepted schedule.
- M. **STATE OWNED FLOAT ACTIVITY.**—The activity documenting time saved on the critical path by actions of the State. It is the last activity prior to the scheduled completion date.
- N. **TIME IMPACT ANALYSIS.**—A schedule and narrative report developed specifically to demonstrate what effect a proposed change or delay has on the current scheduled completion date.
- O. **TOTAL FLOAT.**—The amount of time that an activity or chain of activities can be delayed before extending the scheduled completion date.
- P. **UPDATE SCHEDULE.**—A current schedule developed from the baseline or subsequent schedule through regular monthly review to incorporate as-built progress and any planned changes.

#### **GENERAL REQUIREMENTS**

The Contractor shall submit to the Engineer baseline, monthly update and final update schedules, each consistent in all respects with the time and order of work requirements of the contract. The project work shall be executed in the sequence indicated on the current accepted schedule.

Schedules shall show the order in which the Contractor proposes to carry out the work with logical links between time-scaled work activities, and calculations made using the critical path method to determine the controlling operation or operations. The Contractor is responsible for assuring that all activity sequences are logical and that each schedule shows a coordinated plan for complete performance of the work.

The Contractor shall produce schedules using computer software and shall furnish compatible software for the Engineer's exclusive possession and use. The Contractor shall furnish network diagrams, narrative reports, tabular reports and schedule data as parts of each schedule submittal.

Schedules shall include, but not be limited to, activities that show the following that are applicable to the project:

- A. Project characteristics, salient features, or interfaces, including those with outside entities, that could affect time of completion.
- B. Project start date, scheduled completion date and other milestones.
- C. Work performed by the Contractor, subcontractors and suppliers.
- D. Submittal development, delivery, review and approval, including those from the Contractor, subcontractors and suppliers.
- E. Procurement, delivery, installation and testing of materials, plants and equipment.
- F. Testing and settlement periods.
- G. Utility notification and relocation.
- H. Erection and removal of falsework and shoring.
- I. Major traffic stage switches.
- J. Finishing roadway and final cleanup.
- K. State-owned float as the predecessor activity to the scheduled completion date.

Schedules shall have not less than 50 and not more than 500 activities, unless otherwise authorized by the Engineer. The number of activities shall be sufficient to assure adequate planning of the project, to permit monitoring and evaluation of progress, and to do an analysis of time impacts.

Schedule activities shall include the following:

- A. A clear and legible description.
- B. Start and finish dates.
- C. A duration of not less than one working day, except for event activities, and not more than 20 working days, unless otherwise authorized by the Engineer.
- D. At least one predecessor and one successor activity, except for project start and finish milestones.
- E. Required constraints.
- F. Codes for responsibility, stage, work shifts, location and contract pay item numbers.

The Contractor may show early completion time on any schedule provided that the requirements of the contract are met. Early completion time shall be considered a resource for the exclusive use of the Contractor. The Contractor may increase early completion time by improving production, reallocating resources to be more efficient, performing sequential activities concurrently or by completing activities earlier than planned. The Contractor may also submit for approval a cost reduction incentive proposal in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications that will reduce time of construction.

The Contractor may show a scheduled completion date that is later than the contract completion date on an update schedule, after the baseline schedule is accepted. The Contractor shall provide an explanation for a late scheduled completion date in the narrative report that is included with the schedule.

State-owned float shall be considered a resource for the exclusive use of the State. The Engineer may accrue State-owned float by the early completion of review of any type of required submittal when it saves time on the critical path. The Contractor shall prepare a time impact analysis, when requested by the Engineer, to determine the effect of the action in conformance with the provisions in "Time Impact Analysis" specified herein. The Engineer will document State-owned float by directing the Contractor to update the State-owned float activity on the next update schedule. The Contractor shall include a log of the action on the State-owned float activity and include a discussion of the action in the narrative report. The Engineer may use State-owned float to mitigate past, present or future State delays by offsetting potential time extensions for contract change orders.

The Engineer may adjust contract working days for ordered changes that affect the scheduled completion date, in conformance with the provisions in Section 4-1.03, "Changes," of the Standard Specifications. The Contractor shall prepare a time impact analysis to determine the effect of the change in conformance with the provisions in "Time Impact Analysis" specified herein, and shall include the impacts acceptable to the Engineer in the next update schedule. Changes that do not affect the controlling operation on the critical path will not be considered as the basis for a time adjustment. Changes that do affect the controlling operation on the critical path will be considered by the Engineer in decreasing time or granting an extension of time for completion of the contract. Time extensions will only be granted if the total float is absorbed and the scheduled completion date is delayed one or more working days because of the ordered change.

The Engineer's review and acceptance of schedules shall not waive any contract requirements and shall not relieve the Contractor of any obligation thereunder or responsibility for submitting complete and accurate information. Schedules that are rejected shall be corrected by the Contractor and resubmitted to the Engineer within 5 working days of notification by the Engineer, at which time a new review period of one week will begin.

Errors or omissions on schedules shall not relieve the Contractor from finishing all work within the time limit specified for completion of the contract. If, after a schedule has been accepted by the Engineer, either the Contractor or the Engineer

discover that any aspect of the schedule has an error or omission, it shall be corrected by the Contractor on the next update schedule.

### **COMPUTER SOFTWARE**

The Contractor shall submit to the Engineer for approval a description of proposed software before delivery. The software shall be the current version of Primavera SureTrak Project Manager for Windows, or equal, and shall be compatible with Windows NT (version 4.0) operating system. If software other than SureTrak is proposed, it shall be capable of generating files that can be imported into SureTrak.

The Contractor shall furnish schedule software and all original software instruction manuals to the Engineer with submittal of the baseline schedule. The furnished schedule software shall become the property of the State and will not be returned to the Contractor. The State will compensate the Contractor in conformance with the provisions in Section 4-1.03, "Extra Work," of the Standard Specifications for replacement of software which is damaged, lost or stolen after delivery to the Engineer.

The Contractor shall instruct the Engineer in the use of the software and provide software support until the contract is accepted. Within 20 working days of contract approval, the Contractor shall provide a commercial 8-hour training session for 2 Department employees in the use of the software at a location acceptable to the Engineer. It is recommended that the Contractor also send at least 2 employees to the same training session to facilitate development of similar knowledge and skills in the use of the software. If software other than SureTrak is furnished, then the training session shall be a total of 16-hours for each Department employee.

### **NETWORK DIAGRAMS, REPORTS AND DATA**

The Contractor shall include the following for each schedule submittal:

- A. Two sets of originally plotted, time-scaled network diagrams.
- B. Two copies of a narrative report.
- C. Two copies of each of 3 sorts of the CPM software-generated tabular reports.
- D. One 1.44-megabyte 90 mm (3.5 inch) floppy diskette containing the schedule data.

The time-scaled network diagrams shall conform to the following:

- A. Show a continuous flow of information from left to right.
- B. Be based on early start and early finish dates of activities.
- C. Clearly show the primary paths of criticality using graphical presentation.
- D. Be prepared on E-size sheets, 860 mm x 1120 mm (34 inch x 44 inch).
- E. Include a title block and a timeline on each page.

The narrative report shall be organized in the following sequence with all applicable documents included:

- A. Contractor's transmittal letter.
- B. Work completed during the period.
- C. Identification of unusual conditions or restrictions regarding labor, equipment or material; including multiple shifts, 6-day work weeks, specified overtime or work at times other than regular days or hours.
- D. Description of the current critical path.
- E. Changes to the critical path and scheduled completion date since the last schedule submittal.
- F. Description of problem areas.
- G. Current and anticipated delays:
  - 1. Cause of delay.
  - 2. Impact of delay on other activities, milestones and completion dates.
  - 3. Corrective action and schedule adjustments to correct the delay.
- H. Pending items and status thereof:
  - 1. Permits
  - 2. Change orders
  - 3. Time adjustments
  - 4. Non-compliance notices

- I. Reasons for an early or late scheduled completion date in comparison to the contract completion date.

Tabular reports shall be software-generated and provide information for each activity included in the project schedule. Three different reports shall be sorted by (1) activity number, (2) early start and (3) total float. Tabular reports shall be 215 mm x 280 mm (8 1/2 inch x 11 inch) in size and shall include, as a minimum, the following applicable information:

- A. Data date
- B. Activity number and description
- C. Predecessor and successor activity numbers and descriptions
- D. Activity codes
- E. Scheduled, or actual and remaining durations (work days) for each activity
- F. Earliest start (calendar) date
- G. Earliest finish (calendar) date
- H. Actual start (calendar) date
- I. Actual finish (calendar) date
- J. Latest start (calendar) date
- K. Latest finish (calendar) date
- L. Free float (work days)
- M. Total float (work days)
- N. Percentage of activity complete and remaining duration for incomplete activities.
- O. Lags
- P. Required constraints

Schedule submittals will only be considered complete when all documents and data have been provided as described above.

#### **PRE-CONSTRUCTION SCHEDULING CONFERENCE**

The Contractor shall schedule and the Engineer will conduct a pre-construction scheduling conference with the Contractor's project manager and construction scheduler within 10 working days of the approval of the contract. At this meeting the Engineer will review the requirements of this section of the special provisions with the Contractor.

The Contractor shall submit a general time-scaled logic diagram displaying the major activities and sequence of planned operations and shall be prepared to discuss the proposed work plan and schedule methodology that comply with the requirements of these special provisions. If the Contractor proposes deviations to the construction staging of the project, then the general time-scaled logic diagram shall also display the deviations and resulting time impacts. The Contractor shall be prepared to discuss the proposal.

At this meeting, the Contractor shall additionally submit the alphanumeric coding structure and the activity identification system for labeling the work activities. To easily identify relationships, each activity description shall indicate its associated scope or location of work by including such terms as quantity of material, type of work, bridge number, station to station location, side of highway (such as left, right, northbound, southbound), lane number, shoulder, ramp name, ramp line descriptor or mainline.

The Engineer will review the logic diagram, coding structure, and activity identification system, and provide any required baseline schedule changes to the Contractor for implementation.

#### **BASELINE SCHEDULE**

Beginning the week following the pre-construction scheduling conference, the Contractor shall meet with the Engineer weekly until the baseline schedule is accepted by the Engineer to discuss schedule development and resolve schedule issues.

The Contractor shall submit to the Engineer a baseline schedule within 20 working days of approval of the contract. The Contractor shall allow 3 weeks for the Engineer's review after the baseline schedule and all support data are submitted. In addition, the baseline schedule submittal will not be considered complete until the computer software is delivered and installed for use in review of the schedule.

The baseline schedule shall include the entire scope of work and how the Contractor plans to complete all work contemplated. The baseline schedule shall show the activities that define the critical path. Multiple critical paths and near-critical paths shall be kept to a minimum. A total of not more than 50 percent of the baseline schedule activities shall be critical or near critical, unless otherwise authorized by the Engineer.

The baseline schedule shall not extend beyond the number of working days specified in these special provisions. The baseline schedule shall have a data date of the first working day of the contract and not include any completed work to date.



The baseline schedule shall not attribute negative float or negative lag to any activity.

If the Contractor submits an early completion baseline schedule that shows contract completion in less than 85 percent of the working days specified in these special provisions, the baseline schedule shall be supplemented with resource allocations for every task activity and include time-scaled resource histograms. The resource allocations shall be shown to a level of detail that facilitates report generation based on labor crafts and equipment classes for the Contractor and subcontractors. The Contractor shall use average composite crews to display the labor loading of on-site construction activities. The Contractor shall optimize and level labor to reflect a reasonable plan for accomplishing the work of the contract and to assure that resources are not duplicated in concurrent activities. The time-scaled resource histograms shall show labor crafts and equipment classes to be utilized on the contract. The Engineer may review the baseline schedule activity resource allocations using Means Productivity Standards or equivalent to determine if the schedule is practicable.

### **UPDATE SCHEDULE**

The Contractor shall submit an update schedule and meet with the Engineer to review contract progress, on or before the first day of each month, beginning one month after the baseline schedule is accepted. The Contractor shall allow 2 weeks for the Engineer's review after the update schedule and all support data are submitted, except that the review period shall not start until the previous month's required schedule is accepted. Update schedules that are not accepted or rejected within the review period will be considered accepted by the Engineer.

The update schedule shall have a data date of the twenty-first day of the month or other date established by the Engineer. The update schedule shall show the status of work actually completed to date and the work yet to be performed as planned. Actual activity start dates, percent complete and finish dates shall be shown as applicable. Durations for work that has been completed shall be shown on the update schedule as the work actually occurred, including Engineer submittal review and Contractor resubmittal times.

The Contractor may include modifications such as adding or deleting activities or changing activity constraints, durations or logic that do not (1) alter the critical path(s) or near critical path(s) or (2) extend the scheduled completion date compared to that shown on the current accepted schedule. The Contractor shall state in writing the reasons for any changes to planned work. If any proposed changes in planned work will result in (1) or (2) above, then the Contractor shall submit a time impact analysis as described herein.

### **TIME IMPACT ANALYSIS**

The Contractor shall submit a written time impact analysis (TIA) to the Engineer with each request for adjustment of contract time, or when the Contractor or Engineer consider that an approved or anticipated change may impact the critical path or contract progress.

The TIA shall illustrate the impacts of each change or delay on the current scheduled completion date or internal milestone, as appropriate. The analysis shall use the accepted schedule that has a data date closest to and prior to the event. If the Engineer determines that the accepted schedule used does not appropriately represent the conditions prior to the event, the accepted schedule shall be updated to the day before the event being analyzed. The TIA shall include an impact schedule developed from incorporating the event into the accepted schedule by adding or deleting activities, or by changing durations or logic of existing activities. If the impact schedule shows that incorporating the event modifies the critical path and scheduled completion date of the accepted schedule, the difference between scheduled completion dates of the two schedules shall be equal to the adjustment of contract time. The Engineer may construct and utilize an appropriate project schedule or other recognized method to determine adjustments in contract time until the Contractor provides the TIA.

The Contractor shall submit a TIA in duplicate within 15 working days of receiving a written request for a TIA from the Engineer. The Contractor shall allow the Engineer 2 weeks after receipt to approve or reject the submitted TIA. All approved TIA schedule changes shall be shown on the next update schedule.

If a TIA submitted by the Contractor is rejected by the Engineer, the Contractor shall meet with the Engineer to discuss and resolve issues related to the TIA. If agreement is not reached, the Contractor will be allowed 15 days from the meeting with the Engineer to give notice in conformance with the provisions in Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications. The Contractor shall only show actual as-built work, not unapproved changes related to the TIA, in subsequent update schedules. If agreement is reached at a later date, approved TIA schedule changes shall be shown on the next update schedule. The Engineer will withhold remaining payment on the schedule contract item if a TIA is requested by the Engineer and not submitted by the Contractor within 15 working days. The schedule item payment will resume on the next estimate after the requested TIA is submitted. No other contract payment will be retained regarding TIA submittals.

### **FINAL UPDATE SCHEDULE**

The Contractor shall submit a final update, as-built schedule with actual start and finish dates for the activities, within 30 days after completion of contract work. The Contractor shall provide a written certificate with this submittal signed by the Contractor's project manager and an officer of the company stating, "To my knowledge and belief, the enclosed final

update schedule reflects the actual start and finish dates of the actual activities for the project contained herein." An officer of the company may delegate in writing the authority to sign the certificate to a responsible manager.

## **RETENTION**

The Department will retain an amount equal to 25 percent of the estimated value of the work performed during each estimate period in which the Contractor fails to submit an acceptable schedule conforming to the requirements of these special provisions as determined by the Engineer. Schedule retentions will be released for payment on the next monthly estimate for partial payment following the date that acceptable schedules are submitted to the Engineer or as otherwise specified herein. Upon completion of all contract work and submittal of the final update schedule and certification, any remaining retained funds associated with this section, "Progress Schedule (Critical Path Method)", will be released for payment. Retentions held in conformance with this section shall be in addition to other retentions provided for in the contract. No interest will be due the Contractor on retention amounts.

## **PAYMENT**

Progress schedule (critical path method) will be paid for at a lump sum price. The contract lump sum price paid for progress schedule (critical path method) shall include full compensation for furnishing all labor, material, tools, equipment, and incidentals, including computer software, and for doing all the work involved in preparing, furnishing, and updating schedules, and instructing and assisting the Engineer in the use of computer software, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Payments for the progress schedule (critical path method) contract item will be made progressively as follows:

- A. A total of 25 percent of the item amount or a total of 25 percent of the amount listed for progress schedule (critical path method) in "Payments" of Section 5 of these special provisions, whichever is less, will be paid upon achieving all of the following:
  - 1. Completion of 5 percent of all contract item work.
  - 2. Acceptance of all schedules and TIAs required to the time when 5 percent of all contract item work is complete.
  - 3. Delivery of schedule software to the Engineer.
  - 4. Completion of required schedule software training.
- B. A total of 50 percent of the item amount or a total of 50 percent of the amount listed for progress schedule (critical path method) in "Payments" of Section 5 of these special provisions, whichever is less, will be paid upon completion of 25 percent of all contract item work and acceptance of all schedules and TIAs required to the time when 25 percent of all contract item work is complete.
- C. A total of 75 percent of the item amount or a total of 75 percent of the amount listed for progress schedule (critical path method) in "Payments" of Section 5 of these special provisions, whichever is less, will be paid upon completion of 50 percent of all contract item work and acceptance of all schedules and TIAs required to the time when 50 percent of all contract item work is complete.
- D. A total of 100 percent of the item amount or a total of 100 percent of the amount listed for progress schedule (critical path method) in "Payments" of Section 5 of these special provisions, whichever is less, will be paid upon completion of all contract item work, acceptance of all schedules and TIAs required to the time when all contract item work is complete, and submittal of the certified final update schedule.

If the Contractor fails to complete any of the work or provide any of the schedules required by this section, the Engineer shall make an adjustment in compensation in conformance with the provisions in Section 4-1.03C, "Changes in Character of Work," of the Standard Specifications for the work not performed. Adjustments in compensation for schedules will not be made for any increased or decreased work ordered by the Engineer in furnishing schedules.

## **10-1.07 TIME-RELATED OVERHEAD**

The Contractor will be compensated for time-related overhead in conformance with these special provisions.

Attention is directed to "Beginning of Work, Time of Completion and Liquidated Damages," "Force Account Payment," and "Progress Schedule (Critical Path Method)" of these special provisions.

The provisions in Section 9-1.08, "Adjustment of Overhead Costs," of the Standard Specifications shall not apply.

Time-related overhead shall consist of those overhead costs, including field and home office overhead, that are in proportion to the time required to complete the work. Time-related overhead shall not include costs that are not related to time, including but not limited to, mobilization, licenses, permits, and other charges incurred only once during the contract.

Field office overhead expenses include time-related costs associated with the normal and recurring operations of the

construction project, and shall not include costs directly attributable to the work of the contract. Time-related costs of field office overhead include, but are not limited to, salaries, benefits, and equipment costs of project managers, general superintendents, field office managers and other field office staff assigned to the project, and rent, utilities, maintenance, security, supplies, and equipment costs of the project field office.

Home office overhead or general and administrative expenses refer to the fixed costs of operating the Contractor's business. These costs include, but are not limited to, general administration, insurance, personnel and subcontract administration, purchasing, accounting, and project engineering and estimating. Home office overhead costs shall exclude expenses specifically related to other contracts or other businesses of the Contractor, equipment coordination, material deliveries, and consultant and legal fees.

The quantity of time-related overhead associated with a reduction in contract time for cost reduction incentive proposals accepted and executed in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications shall be considered a construction cost attributable to the resultant estimated net savings due to the cost reduction incentive.

If the final increased quantity of time-related overhead exceeds 149 percent of the number of working days specified in the Engineer's Estimate, the Contractor shall, within 60 days of the Engineer's written request, submit to the Engineer an audit examination and report performed by an independent Certified Public Accountant of the Contractor's actual overhead costs. The independent Certified Public Accountant's audit examination shall be performed in conformance with the requirements of the American Institute of Certified Public Accountants Attestation Standards. The audit examination and report shall depict the Contractor's project and company-wide financial records and shall specify the actual overall average daily rates for both field and home office overhead for the entire duration of the project, and whether the costs have been properly allocated. The rates of field and home office overhead shall exclude unallowable costs as determined in the Federal Acquisition Regulations, 48 CFR, Chapter 1, Part 31. The audit examination and report shall determine if the rates of field office overhead and home office overhead are:

- A. Allowable in conformance with the requirements of the Federal Acquisition Regulations, 48 CFR, Chapter 1, Part 31.
- B. Adequately supported by reliable documentation.
- C. Related solely to the project under examination.

Within 20 days of the Engineer's written request, the Contractor shall make its financial records available for audit by the State for the purpose of verifying the actual rate of time-related overhead specified in the audit submitted by the Contractor. The actual rate of time-related overhead specified in the audit, submitted by the Contractor, will be subject to approval by the Engineer.

If the Engineer requests the independent Certified Public Accountant audit, or if it is requested in writing by the Contractor, the contract item payment rate for time-related overhead, in excess of 149 percent of the number of working days specified in the Engineer's Estimate, will be adjusted to reflect the actual rate.

The cost of performing an independent Certified Public Accountant audit examination and submitting the report, requested by the Engineer, will be borne equally by the State and the Contractor. The division of the cost will be made by determining the cost of providing an audit examination and report in conformance with the provisions of Section 9-1.03B, "Work Performed by Special Forces or Other Special Services," of the Standard Specifications, and paying to the Contractor one-half of that cost. The cost of performing an audit examination and submitting the independent Certified Public Accountant audit report for overhead claims other than for the purpose of verifying the actual rate of time-related overhead shall be entirely borne by the Contractor.

The quantity of time-related overhead to be paid will be measured by the working day, designated in the Engineer's Estimate as WDAY. The estimated number of working days is the number of working days, excluding days for plant establishment, as specified in "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions. The quantity of time-related overhead will be increased or decreased only as a result of suspensions or adjustments of contract time which revise the current contract completion date, and which satisfy any of the following criteria:

- A. Suspensions of work ordered in conformance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications, except:
  - 1. Suspensions ordered due to weather conditions being unfavorable for the suitable prosecution of the controlling operation or operations.
  - 2. Suspensions ordered due to the failure on the part of the Contractor to carry out orders given, or to perform the provisions of the contract.
  - 3. Other suspensions mutually agreed upon between the Engineer and the Contractor.

- B. Extensions of contract time granted by the State in conformance with the provisions in the fifth paragraph in Section 8-1.07, "Liquidated Damages," of the Standard Specifications and set forth in approved contract change orders, in conformance with the provisions in Section 4-1.03, "Changes," of the Standard Specifications.
- C. Reductions in contract time set forth in approved contract change orders, in conformance with the provisions in Section 4-1.03, "Changes," of the Standard Specifications.

In the event an early completion progress schedule, as defined in "Progress Schedule (Critical Path Method)" of these special provisions, is submitted by the Contractor and approved by the Engineer, the amount of time-related overhead eligible for payment will be based on the total number of working days for the project, in conformance with the provisions in "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions, rather than the Contractor's early completion progress schedule.

The contract price paid per working day for time-related overhead shall include full compensation for time-related overhead, including the Contractor's share of costs of the independent Certified Public Accountant audit of overhead costs requested by the Engineer, as specified in these special provisions, and as directed by the Engineer.

The provisions in Sections 4-1.03B, "Increased or Decreased Quantities," and 4-1.03C, "Changes in Character of the Work," of the Standard Specifications shall not apply to the contract item of time-related overhead.

Full compensation for additional overhead costs incurred during days of inclement weather when the contract work is extended into additional construction seasons due to delays caused by the State shall be considered as included in the time-related overhead paid during the contract working days, and no additional compensation will be allowed therefor.

Full compensation for additional overhead costs involved in performing additional contract item work that is not a controlling operation shall be considered as included in the contract items of work involved and no additional compensation will be allowed therefor.

Full compensation for overhead, other than time-related overhead measured and paid for as specified above, and other than overhead costs included in the markups specified in "Force Account Payment" of these special provisions, shall be considered as included in the various items of work and no additional compensation will be allowed therefor.

Overhead costs incurred by joint venture partners, subcontractors, suppliers or other parties associated with the Contractor shall be considered as included in the various overhead costs for which the Contractor is compensated, and no additional compensation will be allowed therefor.

For the purpose of making partial payments pursuant to the provisions in Section 9-1.06, "Partial Payments," of the Standard Specifications, the number of working days to be paid for time-related overhead in each monthly partial payment will be the number of working days, specified above to be measured for payment that occurred during that monthly estimate period, including compensable suspensions and right of way delays. Working days granted by contract change order due to extra work or changes in character of the work, will be paid for upon completion of the contract. The amount earned per working day for time-related overhead shall be the lesser of the following amounts:

- A) The contract item price.
- B) Twenty percent of the original total contract amount divided by the number of working days specified in "Beginning of Work, Time of Completion and Liquidated Damages," of these special provisions.

After acceptance of the contract in conformance with the provisions in Section 7-1.17, "Acceptance of Contract," of the Standard Specifications, the amount of the total contract item price for time-related overhead not yet paid, will be included for payment in the first estimate made after acceptance of the contract in conformance with the provisions in Section 9-1.07, "Payment After Acceptance," of the Standard Specifications.

#### 10-1.08 OBSTRUCTIONS

Attention is directed to Section 8-1.10, "Utility and Non-Highway Facilities," and Section 15, "Existing Highway Facilities," of the Standard Specifications and these special provisions.

The Contractor shall notify the Engineer and the appropriate regional notification center for operators of subsurface installations at least 2 working days, but not more than 14 calendar days, prior to performing any excavation or other work close to any underground pipeline, conduit, duct, wire or other structure. Regional notification centers include, but are not limited to, the following:

Notification Center	Telephone Number
Underground Service Alert-Northern California (USA)	1-800-642-2444 1-800-227-2600

Underground Service Alert-Southern California (USA)	1-800-422-4133 1-800-227-2600
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The following utility facilities will be relocated during the progress of the contract. The Contractor shall notify the Engineer, in writing, prior to doing work in the vicinity of the facility. The utility facility will be relocated within the listed working days, as defined in Section 8-1.06, "Time of Completion," of the Standard Specifications, after the notification is received by the Engineer:

Utility	Location	Working Days
55 m x100 mm Gas Main	"S" Sta 10+00 to 13+00	5
Roseville Telephone	"AM1" Sta 110+03	1

In the event that the utility facilities mentioned above are not removed or relocated by the date specified and, if in the opinion of the Engineer, the Contractor's operations are delayed or interfered with by reason of the utility facilities not being removed or relocated by the date specified, the State will compensate the Contractor for the delays to the extent provided in Section 8-1.09, "Right of Way Delays," of the Standard Specifications, and not otherwise, except as provided in Section 8-1.10, "Utility and Non-Highway Facilities," of the Standard Specifications.

### 10-1.09 MOBILIZATION

Mobilization shall conform to the provisions in Section 11, "Mobilization," of the Standard Specifications.

### 10-1.10 CONSTRUCTION AREA TRAFFIC CONTROL DEVICES

Flagging, signs, and all other traffic control devices furnished, installed, maintained, and removed when no longer required shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Category 1 traffic control devices are defined as those devices that are small and lightweight (less than 45 kg), and have been in common use for many years. The devices shall be known to be crashworthy by crash testing, crash testing of similar devices, or years of demonstrable safe performance. Category 1 traffic control devices include traffic cones, plastic drums, portable delineators, and channelizers.

If requested by the Engineer, the Contractor shall provide written self-certification for crashworthiness of Category 1 traffic control devices. Self-certification shall be provided by the manufacturer or Contractor and shall include the following: date, Federal Aid number (if applicable), expenditure authorization, district, county, route and kilometer post of project limits; company name of certifying vendor, street address, city, state and zip code; printed name, signature and title of certifying person; and an indication of which Category 1 traffic control devices will be used on the project. The Contractor may obtain a standard form for self-certification from the Engineer.

Category 2 traffic control devices are defined as those items that are small and lightweight (less than 45 kg), that are not expected to produce significant vehicular velocity change, but may otherwise be potentially hazardous. Category 2 traffic control devices include: barricades and portable sign supports.

Category 2 devices purchased on or after October 1, 2000 shall be on the Federal Highway Administration (FHWA) Acceptable Crashworthy Category 2 Hardware for Work Zones list. This list is maintained by FHWA and can be located at the following internet address: <http://safety.fhwa.dot.gov/fourthlevel/hardware/listing.cfm?code=workzone>. The Department maintains a secondary list at the following internet address: <http://www.dot.ca.gov/hq/traffops/signtech/signdel/pdf.htm>.

Category 2 devices that have not received FHWA acceptance, and were purchased before October 1, 2000, may continue to be used until they complete their useful service life or until January 1, 2003, whichever comes first. Category 2 devices in use that have received FHWA acceptance shall be labeled with the FHWA acceptance letter number and the name of the manufacturer by the start of the project. The label shall be readable. After January 1, 2003, all Category 2 devices without a label shall not be used on the project.

If requested by the Engineer, the Contractor shall provide a written list of Category 2 devices to be used on the project at least 5 days prior to beginning any work using the devices. For each type of device, the list shall indicate the FHWA acceptance letter number and the name of the manufacturer.

Full compensation for providing self-certification for crashworthiness of Category 1 traffic control devices and for providing a list of Category 2 devices used on the project and labeling Category 2 devices as specified shall be considered as included in the prices paid for the various contract items of work requiring the use of the Category 1 or Category 2 traffic control devices and no additional compensation will be allowed therefor.

### 10-1.11 CONSTRUCTION AREA SIGNS

Construction area signs shall be furnished, installed, maintained, and removed when no longer required in conformance with the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Attention is directed to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. Type II retroreflective sheeting shall not be used on construction area sign panels.

Attention is directed to "Construction Project Information Signs" of these special provisions regarding the number and type of construction project information signs to be furnished, erected, maintained, and removed and disposed of.

The Contractor shall notify the appropriate regional notification center for operators of subsurface installations at least 2 working days, but not more than 14 calendar days, prior to commencing excavation for construction area sign posts. The regional notification centers include, but are not limited to, the following:

Notification Center	Telephone Number
Underground Service Alert-Northern California (USA)	1-800-642-2444 1-800-227-2600
Underground Service Alert-Southern California (USA)	1-800-422-4133 1-800-227-2600

Excavations required to install construction area signs shall be performed by hand methods without the use of power equipment, except that power equipment may be used if it is determined there are no utility facilities in the area of the proposed post holes.

Sign substrates for stationary mounted construction area signs may be fabricated from fiberglass reinforced plastic as specified under "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

The Contractor may be required to cover certain signs during the progress of the work. Signs that are no longer required or that convey inaccurate information to the public shall be immediately covered or removed, or the information shall be corrected. Covers for construction area signs shall be of sufficient size and density to completely block out the complete face of the signs. The retroreflective face of the covered signs shall not be visible either during the day or at night. Covers shall be fastened securely so that the signs remain covered during inclement weather. Covers shall be replaced when they no longer cover the signs properly.

#### **10-1.12 MAINTAINING TRAFFIC**

Attention is directed to Sections 7-1.08, "Public Convenience," 7-1.09, "Public Safety," and 12, "Construction Area Traffic Control Devices," of the Standard Specifications and to the provisions in "Public Safety" of these special provisions and these special provisions. Nothing in these special provisions shall be construed as relieving the Contractor from the responsibilities specified in Section 7-1.09.

Attention is directed to "Traffic Plastic Drums" of these special provisions regarding using plastic drums in place of portable delineators, cones or Type I or II barricades.

Lane and ramp closures shall conform to the provisions in section "Traffic Control System for Lane Closure" and "Traffic Control System for Ramp Closure" of these special provisions.

At locations where falsework pavement lighting is designated, falsework lighting shall be installed in conformance with the provisions in Section 86-6.11, "Falsework Lighting," of the Standard Specifications.

Openings shall be provided through bridge falsework for the use of public traffic at each location where falsework is constructed over the streets or routes listed in the following table. The type, minimum width, height, and number of openings at each location, and the location and maximum spacing of falsework lighting, if required for each opening, shall conform to the requirements in the table. The width of vehicular openings shall be the clear width between temporary railings or other protective work. The spacing shown for falsework pavement lighting is the maximum distance center to center in meters between fixtures.

#### **DOUGLAS – SUNRISE CONNECTOR BRIDGE NO. 19-0018**

	Number	Width	Height
--	--------	-------	--------

Vehicle Openings			
<b>R-2 RAMP</b>	<b>1</b>	<b>7.5m</b>	<b>4.6m min</b>
<b>R-4 RAMP</b>	<b>1</b>	<b>4.8m</b>	<b>4.6m min</b>
<b>R-5 RAMP</b>	<b>1</b>	<b>4.8m</b>	<b>4.6m min</b>
<b>WB 1-80</b>	<b>1</b>	<b>12.6m</b>	<b>4.6m min</b>
<b>EB I-80</b>	<b>1</b>	<b>12.6m</b>	<b>4.6m min</b>
	Location	Spacing	
Falsework Pavement		<b>1 PER WIDENING LOCATION</b>	
<b>R-2 RAMP</b>			
<b>R-4 RAMP</b>			
<b>R-5 RAMP</b>			
<b>WB 1-80</b>	<b>R</b>	<b>9m</b>	
<b>EB I-80</b>	<b>R</b>	<b>9m</b>	
	<b>R</b>	<b>9m</b>	
	<b>R &amp; L</b>	<b>9m</b>	
	<b>R &amp; L</b>	<b>9m</b>	

(Width and Height in meters)

(R = Right side of traffic. L = Left side of traffic)

(C = Centered overhead)

The exact location of openings will be determined by the Engineer.

Personal vehicles of the Contractor's employees shall not be parked on the traveled way or shoulders including any section closed to public traffic.

The Contractor shall notify local authorities of the Contractor's intent to begin work at least 5 days before work is begun. The Contractor shall cooperate with local authorities relative to handling traffic through the area and shall make arrangements relative to keeping the working area clear of parked vehicles.

Whenever vehicles or equipment are parked on the shoulder within 1.8 m of a traffic lane, the shoulder area shall be closed as shown on the plans.

A portable changeable message sign shall be placed for each lane, ramp, or shoulder closure and detour in advance of the first warning sign as shown on the plans, or as directed by the Engineer. Where closures require advanced warning signs for both directions of travel, a portable changeable message sign shall be placed in advance of the first warning sign for each direction of travel.

Except as noted herein, lanes and ramps shall be closed only during the hours shown on the charts included in this section "Maintaining Traffic." Except work required under Sections 7-1.08 and 7-1.09, work that interferes with public traffic shall be performed only during the hours shown for lane closures.

The Contractor shall notify the Engineer 7 calendar days prior to a ramp closure. A portable changeable message sign shall be in place a minimum of 7 calendar days in advance of closing the ramp. When a ramp is closed, public traffic shall be detoured to the preceding or next ramp (including any on-site detours and detours on City roadways) as directed by the Engineer. When portable changeable message signs are no longer required, they shall be removed as directed by the Engineer.

No two consecutive on-ramps or consecutive off-ramps in the same direction of travel shall be closed at the same time except as otherwise provided in these special provisions and as permitted by the Engineer.

Special ramp closures at Douglas Boulevard for the number of working days determined to perform the work but not exceeding 10 days, shall be included and submitted in the Traffic Management Plan prepared by the Contractor. Special closures will be allowed upon approval of the Traffic Management Plan. The Engineer will have 5 working days to comment on or approve the Traffic Management Plan for Douglas Boulevard ramp closures noted above. No ramp work, including closure notification, shall commence without the Engineer's approval of the Traffic Management Plan.

The intersection of Oak Ridge Drive and Ascot Drive are allowed to be closed to traffic for one week for the reconstruction of the intersection (Stage 1). The Contractor shall submit a traffic control plan to the Engineer, for review and approval, 2 weeks prior to commencing the work.

A traffic handling plan has not been prepared for the handling of EB I-80 traffic from the eastbound off-ramp to northbound Sunrise Boulevard during the detour of EB Interstate 80 for falsework erection and removal. It is expected that the handling shall be done with cones and a flagger(s) on Douglas Boulevard. Cones shall be placed to taper all lanes on

Douglas Boulevard down to one through lane prior to the off ramp. The surface mounted curbs that exist on Douglas Boulevard beyond the nose of the gore which limit the existing weave potential shall be removed. Areas outside the curb limits damaged during the curb removal shall be repaired at the contractor's expense. The placing of the cones and the removal of the curbs shall allow for truck and vehicular movements to the northbound Sunrise left turn lanes. The Contractor shall submit a traffic handling plan to the Engineer for review and approval 2 weeks prior to the commencing work at this location. No work for this detour shall commence without the Engineer approval of the traffic handling plan.

No lane closures, shoulder closures, or other traffic restrictions will be allowed on the following day(s) during annual "Hot August Nights" weekend celebration in the Reno, Nevada area will occur during the life of this contract. If notified by the Engineer, the Contractor shall keep all traffic lanes open for use by the public on Friday, Saturday, Sunday and Monday during the celebration. If this requirement delays the controlling operation as specified in 8-1.06, "Time Of Completion," of the Standard Specifications, the days will be considered as non-working days, except as otherwise noted within these special provisions. Route 80, Douglas Boulevard, and Sunrise Boulevard, the full width of the traveled way shall be open for use by public traffic when construction operations are not actively in progress.

Designated legal holidays are: January 1st, the third Monday in February, the last Monday in May, July 4th, the first Monday in September, November 11th, Thanksgiving Day, and December 25th. When a designated legal holiday falls on a Sunday, the following Monday shall be a designated legal holiday. When a designated legal holiday falls on a Saturday, the preceding Friday shall be a designated legal holiday. When a designated legal holiday falls on a Monday, the full width of traveled way shall be open for use by public traffic on the preceding Friday, Saturday and Sunday.

Minor deviations from the requirements of this section concerning hours of work which do not significantly change the cost of the work may be permitted upon the written request of the Contractor, if in the opinion of the Engineer, public traffic will be better served and the work expedited. These deviations shall not be adopted by the Contractor until the Engineer has approved the deviations in writing. All other modifications will be made by contract change order.



Chart No.1 Multilane Lane Requirements																									
Direction: WESTBOUND													Location: 03-PLA-80-2.4/4.8												
FROM HOUR TO HOUR	a.m.											p.m.													
	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	1	1	1	1	1																2	2	2	1	
Fridays	1	1	1	1	1																				
Saturdays	1	1	1	1	1	1	2	2	2	2															
Sundays																					2	2	2	1	
Day before designated legal holiday & Designated legal holidays																									
Legend:																									
1	One lane, a minimum 3.4 m shall be open in direction of travel.																								
2	Two adjacent lanes open in direction of travel																								
	No closure allowed																								
REMARKS: Ramp closure allowed during lane closure.																									

Chart No. 2 Multilane Lane Requirements																									
Direction: Eastbound													Location: 03-PLA-80-2.4/4.8												
FROM HOUR TO HOUR	a.m.												p.m.												
	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	1	1	1	1	1																2	2	2	1	
Fridays	1	1	1	1	1																		2	1	
Saturdays	1	1	1	1	1	1	2																		
Sundays																							2	2	1
Day before designated legal holiday & Designated legal holidays																									
Legend:																									
1		One lane, a minimum 3.4 m shall be open in direction of travel.																							
2		Two adjacent lanes open in direction of travel																							
		No closure allowed																							
REMARKS: Ramp closure allowed during lane closure																									

Chart No. 3 Multilane Lane Requirements																									
Direction: WESTBOUND/EASTBOUND													Location: SEE REMARKS												
FROM HOUR TO HOUR	a.m.												p.m.												
	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	1	1	1	1	1																	1	1	1	
Fridays	1	1	1	1	1																		1	1	
Saturdays	1	1	1	1	1	1	1	1																	
Sundays																						1	1	1	
Day before designated legal holiday & Designated legal holidays																									
Legend:																									
1		One lane, a minimum 3.4 m shall be open in direction of travel.																							
		No lane closure allowed																							
REMARKS: Ramp closure allowed during lane closure DOUGLAS BOULEVARD – HARDING TO SUNRISE.																									

Chart No. 4 Multilane Lane Requirements																									
Direction: NORTHBOUND/SOUTHBOUND													Location: SUNRISE AVENUE-FRANCIS TO ASCOT												
FROM HOUR TO HOUR	a.m.												p.m.												
	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	1	1	1	1	1	1	1														1	1	1	1	
Fridays	1	1	1	1	1	1	1																1	1	
Saturdays	1	1	1	1	1	1	1																		
Sundays																							1	1	
Day before designated legal holiday & Designated legal holidays																									
Legend:																									
1	One lane, a minimum 3.4 m shall be open in direction of travel.																								
	No lane closure allowed																								
REMARKS: Ramp closure allowed during lane closure																									

Chart No. 5 Ramp Lane Requirements																									
Direction: EASTBOUND													Location: OFF-RAMP (R-2 LINE)												
FROM HOUR TO HOUR	a.m.												p.m.												
	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	X	X	X	X	X																X	X	X	X	
Fridays	X	X	X	X	X																		X	X	
Saturdays	X	X	X	X	X	X	X																		
Sundays																						X	X	X	
Day before designated legal holiday & Designated legal holidays																									
Legend:																									
<div>X Ramp may be closed</div>																									
<div></div> No closure allowed																									
REMARKS: THIS RAMP FOR CLOSURE FOR STAGE 3. Ramp closure allowed during lane closure.																									

Chart No. 6 Ramp Lane Requirements																									
Direction: WESTBOUND													Location: ON-RAMP (R-3 LINE)												
FROM HOUR TO HOUR	a.m.											p.m.													
	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	X	X	X	X	X																X	X	X	X	
Fridays	X	X	X	X	X																		X	X	
Saturdays	X	X	X	X	X	X	X																		
Sundays																						X	X	X	
Day before designated legal holiday & Designated legal holidays																									
Legend:																									
X	Ramp may be closed																								
	No closure allowed																								
REMARKS: Ramp closure allowed during lane closure.																									

Chart No. 7 Ramp Lane Requirements																									
Direction: EASTBOUND													Location: OFF-RAMP (R-4 LINE)												
FROM HOUR TO HOUR	a.m.											p.m.													
	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	X	X	X	X	X																X	X	X	X	
Fridays	X	X	X	X	X																		X	X	
Saturdays	X	X	X	X	X	X	X																		
Sundays																						X	X	X	
Day before designated legal holiday & Designated legal holidays																									
Legend:																									
<div>X</div>		Ramp may be closed																							
<div></div>		No closure allowed																							
REMARKS: Ramp closure allowed during lane closure.																									

Chart No. 8 Ramp Lane Requirements																									
Direction: WESTBOUND													Location: ON-RAMP (R-5 LINE)												
FROM HOUR TO HOUR	a.m.												p.m.												
	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	X	X	X	X	X																X	X	X	X	
Fridays	X	X	X	X	X																		X	X	
Saturdays	X	X	X	X	X	X	X																		
Sundays																						X	X	X	
Day before designated legal holiday & Designated legal holidays																									
Legend:																									
<div>X</div>		Ramp may be closed																							
<div></div>		No closure allowed																							
REMARKS: THIS CHART FOR CLOSURE AFTER STAGE 1 IS COMPLETE. Ramp closure allowed during lane closure.																									

Chart No. 9 Ramp Lane Requirements																									
Direction: EASTBOUND													Location: ON-RAMP (R-6 LINE)												
FROM HOUR TO HOUR	a.m.												p.m.												
	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	X	X	X	X	X																X	X	X	X	
Fridays	X	X	X	X	X																		X	X	
Saturdays	X	X	X	X	X	X	X																		
Sundays																						X	X	X	
Day before designated legal holiday & Designated legal holidays																									
Legend:																									
<div>X</div>		Ramp may be closed																							
<div></div>		No closure allowed																							
REMARKS: THIS CHART FOR CLOSURE IN STAGE 2.																									
Ramp closure allowed during lane closure.																									

Chart No. 10 Ramp Lane Requirements																									
Direction: WESTBOUND													Location: OFF-RAMP (R-7 LINE)-STA AM1 113+40 TO DOUGLAS BLVD.												
FROM HOUR TO HOUR	a.m.											p.m.													
	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	X	X	X	X	X																X	X	X	X	
Fridays	X	X	X	X	X																		X	X	
Saturdays	X	X	X	X	X	X	X																		
Sundays																						X	X	X	
Day before designated legal holiday & Designated legal holidays																									
Legend:																									
X	Ramp may be closed. A minimum of one paved ramp lane not less than 3.4 m shall be open for use by public traffic.																								
	No closure allowed																								
REMARKS: THIS CHART FOR CLOSURE IN STAGE 3.																									
Ramp closure allowed during lane closure.																									

Chart No. 11 Ramp Lane Requirements																											
Direction: WESTBOUND														Location: OFF-RAMP (R-7 LINE)-STA R7 6+61.96 TO DOUGLAS BLVD.													
FROM HOUR TO HOUR		a.m.												p.m.													
		12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
Mondays through Thursdays																											
Fridays																									X	X	
Saturdays		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Sundays		X	X	X	X	X	X	X	X	X	X																
Day before designated legal holiday & Designated legal holidays																											
<div>Legend:</div> <div><div>X</div>Ramp may be closed. A minimum of one paved ramp lane not less than 3.4 m shall be open for use by public traffic.</div> <div><div></div>No closure allowed</div>																											
REMARKS: <b>THIS CHART FOR FULL CLOSURE IN STAGE 3.</b> Ramp closure allowed during lane closure.																											

Chart No. 12 Multilane Lane Requirements																										
Direction: WESTBOUND/EASTBOUND													Location: 03-PLA-80-2.4/4.6													
FROM HOUR TO HOUR	a.m.											p.m.														
	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
Mondays through Thursdays																										
Fridays	Y	Y	Y	Y	Y																		1	1		
Saturdays																										
Sundays																										
Day before designated legal holiday & Designated legal holidays																										
Legend:																										
Y	Full closure allowed during detour as shown on the plans.																									
1	One lane, a minimum 3.4 m shall be open in direction of travel.																									
	No closure allowed																									
REMARKS: THIS CHART FOR FULL CLOSURE FOR FALSEWORK ERECTION AND REMOVAL. Ramp closure allowed during lane closure																										

During periods when traffic control will be in place at signalized intersections, the signals may be shut down or set on flashing mode. The Contractor shall notify the Engineer at least 5 working days prior to traffic control operations that will necessitate traffic signals being shut down or set on flashing mode. The Contractor shall provide the Engineer with the schedule of times the signals will either be shut down or set on flashing mode, and the times the signals will be restored to normal operating mode. State forces will perform all changes in signal operation modes at State controlled intersections. The City of Roseville will perform any changes in signal operations modes for its intersections. The Contractor shall submit the following Intersection Red Flash Approval form to the City for approval at least 5 working days prior to any red flash operations. This form includes requirements for red flash as well as serves as their written request for flash.

### INTERSECTION RED FLASH APPROVAL FORM

With stamped approval of this letter by the Traffic Section, Red Flash is approved for the following intersection;

**LOCATION**

\_\_\_\_\_

**DATE**

\_\_\_\_\_

**TIME**

\_\_\_\_\_

**SIGNATURE**

\_\_\_\_\_

### REQUIREMENTS FOR RED FLASH

1. The Contractor shall place "Stop Ahead" C-W17 and "Stop" R-1 signs to direct vehicle and pedestrian traffic through the intersection during traffic signal system shutdown. Temporary "Stop Ahead" and "Stop" signs shall be removed when the system is turned on.
2. "Stop Ahead" and "Stop" signs shall be furnished by the Contractor. Minimum size of "Stop" signs shall be 914 mm for single sign placements and 610 mm for dual sign placements.
3. One "Stop Ahead" sign and one "Stop" sign shall be placed for each direction of traffic. For approaches with two or more through or left turn lanes, two "Stop" signs shall be placed. Typical sign placement shall be between the left turn and through lanes. Additional "Stop" signs shall be placed on the shoulder. No "Stop" signs shall be placed in a manner that blocks bike lanes.
4. One "Stop Ahead" sign and one "Stop" sign shall be in place immediately after the intersection in placed in red flash and removed immediately prior to the intersection being taken out of red flash.
5. No turning movements shall be restricted until signal is placed into red flash.
6. Flares shall be placed at the base of the "Stop" sign during nighttime (dark) hours.
7. Contractor shall contact the City Inspector and Traffic Signal Technicians at (916) 774-5787, 48 hours and the Engineer prior to placing intersection in red flash. Signal shutdown shall be performed only by City or State personnel, unless otherwise directed by the Engineer.
8. No time extensions will be allowed.
9. City Police and Fire shall be notified at (916) 774-5118 one hour prior to placing signal in red flash and 10 minutes after removing signal from red flash.
10. The Contractor shall reimburse the City for the actual cost of all inspection, including City Traffic Signal Technician time as required.

The Contractor is required to follow all requirements of this letter and keep a signed and stamped copy of this letter at the job site.

Pedestrian access facilities shall be provided through construction areas within the right of way as shown on the plans and as specified herein. Pedestrian walkways shall be surfaced with asphalt concrete, portland cement concrete or timber. The surface shall be skid resistant and free of irregularities. At least one walkway shall be available along Douglas Boulevard over Route 80 at all times. If the Contractor's operations require the closure of one walkway, then another walkway shall be provided nearby, off the traveled roadway.

In addition, pedestrian facilities shall be provided during pile placement, footing, wall, and other bridge construction operations. At least one walkway shall be available at all times. If the Contractor's operations require the closure of one walkway, then another walkway shall be provided nearby, off the traveled roadway.

Full compensation for providing pedestrian facilities shall be considered as included in the prices paid for the various contract items of work involved and no additional compensation will be allowed therefor.

Erection and removal of falsework at locations where falsework openings are required shall be undertaken one location at a time. During falsework erection and removal, public traffic in the lanes over which falsework is being erected or removed shall be detoured as shown on plans during the hours shown on the charts in this section, "Maintaining Traffic". Following each time traffic is detoured, the accumulated traffic shall pass through the work before another closure is made. Erection shall include all adjustments or removal of falsework components prior to concrete placement that contribute to the horizontal stability of the falsework system. Removal shall include lowering falsework, blowing sand from sand jacks, turning screws on screw jacks, and removing wedges.

Local detours shall not be less the width shown on the plans.

Regardless of the construction procedure, or methods and equipment selected, the Contractor shall have necessary materials and equipment on the site to erect or remove the falsework in any one span prior to detouring, and shall erect or remove the falsework in any one span or over any opening prior to stopping public traffic, and shall erect or remove the falsework in an expeditious

manner in order that inconvenience to public traffic will be at a minimum

### **10-1.13 CLOSURE REQUIREMENTS AND CONDITIONS**

Lane closures shall conform to the provisions in "Maintaining Traffic" of these special provisions and these special provisions.

The term closure, as used herein, is defined as the closure of a traffic lane or lanes, including ramp or connector lanes, within a single traffic control system.

#### **CLOSURE SCHEDULE**

By noon Monday, the Contractor shall submit a written schedule of planned closures for the following week period, defined as Friday noon through the following Friday noon.

The Closure Schedule shall show the locations and times when the proposed closures are to be in effect. The Contractor shall use the Closure Schedule request forms furnished by the Engineer. Closure Schedules submitted to the Engineer with incomplete, unintelligible or inaccurate information will be returned for correction and resubmittal. The Contractor will be notified of disapproved closures or closures that require coordination with other parties as a condition of approval.

Amendments to the Closure Schedule, including adding additional closures, shall be submitted to the Engineer, in writing, at least 3 working days in advance of a planned closure. Approval of amendments to the Closure Schedule will be at the discretion of the Engineer.

The Contractor shall confirm, in writing, all scheduled closures by no later than 8:00 a.m. 3 working days prior to the date on which the closure is to be made. Approval or denial of scheduled closures will be made no later than 4:00 p.m. 2 working days prior to the date on which the closure is to be made. Closures not confirmed or approved will not be allowed.

Confirmed closures that are cancelled due to unsuitable weather may be rescheduled at the discretion of the Engineer for the following working day.

#### **CONTINGENCY PLAN**

The Contractor shall prepare a contingency plan for reopening closures to public traffic. The Contractor shall submit the contingency plan for a given operation to the Engineer within one working day of the Engineer's request.

#### **LATE REOPENING OF CLOSURES**

If a closure is not reopened to public traffic by the specified time, work shall be suspended in conformance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications. The Contractor shall not make any further closures until the Engineer has accepted a work plan, submitted by the Contractor, that will insure that future closures will be reopened to public traffic at the specified time. The Engineer will have 2 working days to accept or reject the Contractor's proposed work plan. The Contractor will not be entitled to any compensation for the suspension of work resulting from the late reopening of closures.

For each 10-minute interval, or fraction thereof past the time specified to reopen the closure, the Department will deduct \$5,000.00 per interval from moneys due or that may become due the Contractor under the contract.

#### **COMPENSATION**

The Contractor shall notify the Engineer of any delay in the Contractor's operations due to the following conditions, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of those conditions, and the Contractor's loss due to that delay could not have been avoided by rescheduling the affected closure or by judicious handling of forces, equipment and plant, the delay will be considered a right of way delay within the meaning of Section 8-1.09, "Right of Way Delays," and compensation for the delay will be determined in conformance with the provisions in Section 8-1.09:



- A. The Contractor's proposed Closure Schedule is denied and his planned closures are within the time frame allowed for closures in "Maintaining Traffic" of these special provisions, except that the Contractor will not be entitled to any compensation for amendments to the Closure Schedule that are not approved.
- B. The Contractor is denied a confirmed closure.

Should the Engineer direct the Contractor to remove a closure prior to the time designated in the approved Closure Schedule, any delay to the Contractor's schedule due to removal of the closure will be considered a right of way delay within the meaning of Section 8-1.09, "Right of Way Delays," and compensation for the delay will be determined in conformance with the provisions in Section 8-1.09.

#### **10-1.14 CONSTRUCTION ZONE ENHANCED ENFORCEMENT**

Construction zone enhanced enforcement will be provided by the State as directed by the Engineer and in conformance with these special provisions. Construction zone enhanced enforcement shall consist of the presence of the California Highway Patrol (CHP) within and near the limits of construction during specified stages of work to control the movement of public traffic within the work zone. A total of 700 hours of California Highway Patrol support is available.

Construction zone enhanced enforcement will be required during the performance of the following stages of work:

- 1. Overcrossing Falsework Erection – Freeway Closure
- 2. Overcrossing Falsework Removal – Freeway Closure
- 3. Placing Temporary Railing (Type K) – Freeway Lane Closure
- 4. Removing Temporary Railing (Type K) – Freeway Lane Closure

In addition to stages of work requiring CHP presence, the Engineer will provide additional CHP support as deemed appropriate by the Engineer.

The Contractor shall submit a schedule to the Engineer at least 15 days prior to the performance of work requiring construction zone enhanced enforcement. The schedule shall include all activities requiring construction zone enhanced enforcement and the estimated hours of CHP support required for each activity. The work shall be performed within the number of hours allocated for CHP support.

The Contractor may request additional CHP support for other times and in support of other work activities. The Contractor shall bear the costs and expenses for additional CHP support. The CHP shall be compensated at an agreed rate of \$65 per hour per CHP Officer. The agreed rate shall be considered full compensation for each hour, or portion thereof, that a CHP Officer is performing construction area enhanced enforcement. There will be no markup applied to any expenses connected with CHP support. The costs and expenses for requested additional CHP support will be deducted from moneys due to the Contractor.

The Engineer will make all arrangements with the CHP for scheduled and requested additional construction zone enhanced enforcement.

CHP support shall be scheduled in compliance with the provisions in "Closure Requirements and Conditions" of these special provisions. The Contractor will be notified in writing of assigned CHP support when the Contractor is informed of the approval of requested closures.

The Contractor shall inform the Engineer in writing at least 96 hours prior to a closure scheduled for construction zone enhancement enforcement. The written notice shall be delivered to the Engineer between the hours of 7:00 a.m. and 3:00 p.m., Monday through Friday, excluding designated legal holidays.

Cancellations to previously approved closures scheduled to include construction zone enhancement enforcement shall be submitted in writing to the Engineer at least 36 hours prior to the time when the closure is to be in place. Written notices of cancellation for a closure shall be delivered to the Engineer between the hours of 7:00 a.m. and 3:00 p.m., Monday through Friday, excluding designated legal holidays.

Cancellations with less than the 36-hour written notice may result in charges from the CHP. The Contractor shall bear any costs and expenses resulting from cancellations with less than the 36 hour written notice, except cancellations due to weather or circumstances beyond the control of the Contractor, as determined by the Engineer. The CHP shall be compensated not less than \$65.00 per hour and no greater than 4 hours of overtime pay per CHP Officer scheduled to participate in the construction zone enhancement enforcement that is cancelled. The costs and expenses incurred for late cancellations will be deducted from moneys due or that may become due the Contractor.

The presence of the California Highway Patrol will not relieve the Contractor of responsibility of providing for the safety of the public in conformance with the requirements in Section 7-1.09, "Public Safety," nor relieve the Contractor from the responsibility for damage in conformance with the requirements in Section 7-1.12, "Responsibility for Damage," of the Standard Specifications.

### **10-1.15 TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE**

A traffic control system shall consist of closing traffic lanes in conformance with the details shown on the plans, the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications, the provisions under "Maintaining Traffic" and "Construction Area Signs" of these special provisions, and these special provisions.

The provisions in this section will not relieve the Contractor from the responsibility to provide additional devices or take measures as may be necessary to comply with the provisions in Section 7-1.09, "Public Safety," of the Standard Specifications.

During traffic stripe operations and pavement marker placement operations using bituminous adhesive, traffic shall be controlled, at the option of the Contractor, with either stationary or moving lane closures. During other operations, traffic shall be controlled with stationary lane closures. Attention is directed to the provisions in Section 84-1.04, "Protection From Damage," and Section 85-1.06, "Placement," of the Standard Specifications.

If components in the traffic control system are displaced or cease to operate or function as specified, from any cause, during the progress of the work, the Contractor shall immediately repair the components to the original condition or replace the components and shall restore the components to the original location.

#### **STATIONARY LANE CLOSURE**

When lane closures are made for work periods only, at the end of each work period, all components of the traffic control system, except portable delineators placed along open trenches or excavation adjacent to the traveled way, shall be removed from the traveled way and shoulder. If the Contractor so elects, the components may be stored at selected central locations designated by the Engineer within the limits of the highway right of way.

Each vehicle used to place, maintain and remove components of a traffic control system on multilane highways shall be equipped with a Type II flashing arrow sign, cellular phones and radios which shall be in operation when the vehicle is being used for placing, maintaining or removing the components. Vehicles equipped with Type II flashing arrow sign not involved in placing, maintaining or removing the components when operated within a stationary type lane closure shall only display the caution display mode. The sign shall be controllable by the operator of the vehicle while the vehicle is in motion. The flashing arrow sign shown on the plans shall not be used on the vehicles which are doing the placing, maintaining and removing of components of a traffic control system and shall be in place before a lane closure requiring the sign's use is completed.

On 2-lane, 2-way roadways, one-way traffic shall be controlled through the project in conformance with the plan entitled "Traffic Control System for Lane Closure on Two Lane Conventional Highways" and these special provisions.

Each vehicle used to place, maintain and remove components of a traffic control system and each flagger shall have a cellular phone and radio contact with personnel in the work area.

When flaggers are required, additional advance flaggers will be required.

On 2-lane, 2-way roadways, utilizing a pilot car will be at the option of the Contractor. If the Contractor elects to use a pilot car, the cones shown along the centerline on the plan need not be placed. The pilot car shall have radio contact with personnel in the work area. The maximum speed of the pilot car through the traffic control zone shall be 40 kilometers per hour (25 mph).

#### **MOVING LANE CLOSURE**

Flashing arrow signs used in moving lane closures shall be truck-mounted. Flashing arrow signs shall be in the caution display mode when used on 2-lane highways. Changeable message signs used in moving lane closure operations shall conform to the provisions in Section 12-3.12, "Portable Changeable Message Signs," of the Standard Specifications, except the signs shall be truck-mounted. The full operation height of the bottom of the sign may be less than 2.1 m above the ground, but should be as high as practicable.

Truck-mounted attenuators (TMA) for use in moving lane closures shall be any of the following approved models, or equal:

- A. Hexfoam TMA Series 3000, Alpha 1000 TMA Series 1000 and Alpha 2001 TMA Series 2001, manufactured by Energy Absorption Systems, Inc., One East Wacker Drive, Chicago, IL 60601-2076, Telephone (312) 467-6750.
  - 1. Distributor (Northern): Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828, Telephone 1-800-884-8274, FAX (916) 387-9734.
  - 2. Distributor (Southern): Traffic Control Service, Inc., 1881 Betmor Lane, Anaheim, CA 92805, Telephone 1-800-222-8274.
- B. Cal T-001 Model 2 or Model 3, manufacturer and distributor; Hexcel Corporation, 11711 Dublin Boulevard, P.O.

Box 2312, Dublin, CA 94568, Telephone (510) 828-4200.

- C. Renco Rengard Model Nos. CAM 8-815 and RAM 8-815, manufacturer and distributor, Renco Inc., 1582 Pflugerville Loop Road, P.O. Box 730, Pflugerville, TX 78660-0730, Telephone 1-800-654-8182.

Each TMA shall be individually identified with the manufacturer's name, address, TMA model number, and a specific serial number. The names and numbers shall each be a minimum 13 mm high and located on the left (street) side at the lower front corner. The TMA shall have a message next to the name and model number in 13 mm high letters which states, "The bottom of this TMA shall be 21000 mm  $\pm$  100 mm above the ground at all points for proper impact performance." A TMA which is damaged or appears to be in poor condition shall not be used unless recertified by the manufacturer. The Engineer shall be the sole judge whether used TMAs supplied under this contract need recertification. Each unit shall be certified by the manufacturer to meet the requirements for TMAs in conformance with the standards established by the Transportation Laboratory.

Approvals for new TMA designs proposed as equal to the above approved models shall be in conformance with the procedures (including crash testing) established by the Transportation Laboratory. For information regarding submittal of new designs for evaluation contact: Transportation Laboratory, 5900 Folsom Boulevard, Sacramento, CA 95819.

New TMAs proposed as equal to approved TMAs or approved TMAs determined by the Engineer to need recertification shall not be used until approved or recertified by the Transportation Laboratory.

## **PAYMENT**

The contract lump sum price paid for traffic control system shall include full compensation for furnishing all labor (except for flagging costs), materials (including signs), tools, equipment, and incidentals (including cellular phones and radios), and for doing all the work involved in placing, removing, storing, maintaining, moving to new locations, replacing, and disposing of the components of the traffic control system and for furnishing and operating the pilot car, (including driver, radios, other equipment, and labor required), as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer. Flagging costs will be paid for as provided in Section 12-2.02, "Flagging Costs," of the Standard Specifications.

The adjustment provisions in Section 4-1.03, "Changes," of the Standard Specifications shall not apply to the item of traffic control system. Adjustments in compensation for traffic control system will be made only for increased or decreased traffic control system required by changes ordered by the Engineer and will be made on the basis of the cost of the increased or decreased traffic control necessary. The adjustment will be made on a force account basis as provided in Section 9-1.03, "Force Account Payment," of the Standard Specifications for increased work, and estimated on the same basis in the case of decreased work.

Traffic control system required by work which is classed as extra work, as provided in Section 4-1.03D of the Standard Specifications, will be paid for as a part of the extra work.

### **10-1.16 TRAFFIC CONTROL SYSTEM FOR RAMP CLOSURES**

At the times and locations specified under "Maintaining Traffic" of these special provisions, ramps shall be closed in conformance with the details shown on the plans, the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications, and these special provisions.

The provisions in this section will not relieve the Contractor of the responsibility to provide additional devices or take measures as may be necessary to comply with the provisions in Section 7-1.09, "Public Safety," of the Standard Specifications.

If components used for closing a ramp are displaced or cease to operate or function as specified, from any cause, during the progress of the work, the Contractor shall immediately repair the components to the original condition or replace the components and shall restore the components to the original location.

When ramp closures are made for work periods only, at the end of each work period, components used for the ramp closure, except portable delineators placed along open trenches or excavation adjacent to the traveled way, shall be removed from the traveled way and shoulder. If the Contractor so elects, the components may be stored at selected central locations designated by the Engineer within the limits of the highway right of way.

RAMP CLOSED signs (SC6-3) shall be used to inform motorists of the temporary closing of a freeway or expressway entrance or exit ramp for not more than one day.

RAMP CLOSED signs (SC6-4) shall be used to inform motorists of the temporary closing of a freeway or expressway entrance or exit ramp for more than one day.

The SC6-3 or SC6-4 signs shall be installed at least 7 calendar days prior to closing the ramp, but not more than 14 days in advance of the ramp closure. The Contractor shall notify the Engineer not less than 2 calendar days prior to installing the SC6-3 or SC6-4 signs. The SC6-3 or SC6-4 signs shall be stationary mounted at locations shown on the plans and shall remain in place and visible to motorists during ramp closures.

The Contractor shall be responsible for maintaining accurate and timely information on the SC6-3 or SC6-4 signs. The SC6-3 or SC6-4 signs, when no longer required or when the information becomes outdated, shall be immediately covered or removed, or the sign message shall be updated.

Full compensation for providing the ramp closures shown on the plans, including furnishing, installing, maintaining, covering, and removing SC6-3 and SC6-4 signs, shall be considered as included in the contract prices paid for the various items of work involved and no separate payment will be made therefor.

#### **10-1.17 TEMPORARY PAVEMENT DELINEATION**

Temporary pavement delineation shall be furnished, placed, maintained, and removed in conformance with the provisions in Section 12-3.01, "General," of the Standard Specifications and these special provisions. Nothing in these special provisions shall be construed as reducing the minimum standards specified in the Manual of Traffic Controls published by the Department or as relieving the Contractor from the responsibilities specified in Section 7-1.09, "Public Safety," of the Standard Specifications.

##### **GENERAL**

Whenever the work causes obliteration of pavement delineation, temporary or permanent pavement delineation shall be in place prior to opening the traveled way to public traffic. Laneline or centerline pavement delineation shall be provided at all times for traveled ways open to public traffic. On multilane roadways (freeways and expressways) edgeline delineation shall be provided at all times for traveled ways open to public traffic.

The Contractor shall perform the work necessary to establish the alignment of temporary pavement delineation, including required lines or marks. Surfaces to receive temporary pavement delineation shall be dry and free of dirt and loose material. Temporary pavement delineation shall not be applied over existing pavement delineation or other temporary pavement delineation. Temporary pavement delineation shall be maintained until superseded or replaced with a new pattern of temporary pavement delineation or permanent pavement delineation.

Temporary pavement markers, including underlying adhesive, and removable traffic tape which are applied to the final layer of surfacing or existing pavement to remain in place or which conflicts with a subsequent or new traffic pattern for the area shall be removed when no longer required for the direction of public traffic, as determined by the Engineer.

##### **TEMPORARY LANELINE AND CENTERLINE DELINEATION**

Whenever lanelines or centerlines are obliterated and temporary pavement delineation to replace the lines is not shown on the plans, the minimum laneline and centerline delineation to be provided for that area shall be temporary pavement markers placed at longitudinal intervals of not more than 7.3 m. The temporary pavement markers shall be the same color as the laneline or centerline the pavement markers replace. Temporary pavement markers shall be, at the option of the Contractor, one of the temporary pavement markers listed for short term day/night use (14 days or less) or long term day/night use (6 months or less) in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. The temporary pavement markers shall be placed in conformance with the manufacturer's instructions. Temporary pavement markers for long term day/night use (6 months or less) shall be cemented to the surfacing with the adhesive recommended by the manufacturer, except epoxy adhesive shall not be used to place the temporary pavement markers in areas where removal of the temporary pavement markers will be required.

Temporary laneline or centerline delineation consisting entirely of temporary pavement markers listed for short term day/night use (14 days or less), shall be placed on longitudinal intervals of not more than 7.3 m and shall be used for a maximum of 14 days on lanes opened to public traffic. Prior to the end of the 14 days the permanent pavement delineation shall be placed. If the permanent pavement delineation is not placed within the 14 days, the Contractor shall replace the temporary pavement markers and provide additional temporary pavement delineation and shall bear the cost thereof. The additional temporary pavement delineation to be provided shall be equivalent to the pattern specified for the permanent pavement delineation for the area, as determined by the Engineer.

Full compensation for furnishing, placing, maintaining, and removing the temporary pavement markers (including underlying adhesive, layout (dribble) lines to establish alignment of temporary pavement markers or used for temporary laneline and centerline delineation-for those areas where temporary laneline and centerline delineation is not shown on the plans and for providing equivalent patterns of permanent traffic lines for those areas when required, shall be considered as included in the contract prices paid for the items of work that obliterated the laneline and centerline pavement delineation and no separate payment will be made therefor.

##### **TEMPORARY EDGELINE DELINEATION**

On multilane roadways (freeways and expressways), whenever edgelines are obliterated and temporary pavement delineation to replace those edgelines is not shown on the plans, the edgeline delineation to be provided for those areas

adjacent to lanes open to public traffic shall be as follows:

- A. Temporary pavement delineation for right edgelines shall, at the option of the Contractor, consist of either a solid 100-mm wide traffic stripe of the same color as the stripe the temporary edgeline delineation replaces, or traffic cones, portable delineators or channelizers placed at longitudinal intervals not to exceed 30 m.
- B. Temporary pavement delineation for left edgelines shall, at the option of the Contractor, consist of either solid 100-mm wide traffic stripe of the same color as the stripe the temporary edgeline delineation replaces, traffic cones, portable delineators or channelizers placed at longitudinal intervals not to exceed 30 m or temporary pavement markers placed at longitudinal intervals of not more than 1.8 m. Temporary pavement markers used for temporary left edgeline delineation shall be one of the types of temporary pavement markers listed for short term day/night use (14 days or less) or long term day/night use (6 months or less) in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Traffic stripe (100-mm wide) placed as temporary edgeline delineation which will require removal shall conform to the provisions of "Temporary Traffic Stripe (Tape)" of these special provisions. Where removal of the 100-mm wide traffic stripe will not be required, painted traffic stripe conforming to the provisions of "Temporary Traffic Stripe (Paint)" of these special provisions may be used. The quantity of temporary traffic stripe (tape) or temporary traffic stripe (paint) used for this temporary edgeline delineation will not be included in the quantities of tape or paint to be paid for.

Temporary traffic stripe (paint) shall not be used for temporary edgeline delineation on the final layer of surfacing.

The lateral offset for traffic cones, portable delineators or channelizers used for temporary edgeline delineation shall be as determined by the Engineer. If traffic cones or portable delineators are used as temporary pavement delineation for edgelines, the Contractor shall provide personnel to remain at the project site to maintain the cones or delineators during the hours of the day that the portable delineators are in use.

Channelizers used for temporary edgeline delineation shall be the surface mounted type and shall be orange in color. Channelizer bases shall be cemented to the pavement in the same manner provided for cementing pavement markers to pavement in "Pavement Markers" of these special provisions, except epoxy adhesive shall not be used to place channelizers on the top layer of pavement. Channelizers shall be, at the Contractor's option, one of the surface mount types (900 mm) listed in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Temporary edgeline delineation shall be removed when no longer required for the direction of public traffic as determined by the Engineer.

The quantity of channelizers used as temporary edgeline delineation will not be included in the quantity of channelizers to be paid for. Full compensation for furnishing, placing, maintaining and removing temporary edgeline delineation for those areas where temporary edgeline delineation is not shown on the plans shall be considered as included in the contract prices paid for the items of work that obliterated the edgeline pavement delineation and no separate payment will be made therefor.

#### **TEMPORARY TRAFFIC STRIPE (TAPE)**

Temporary traffic stripe consisting of removable traffic stripe tape shall be applied at the locations shown on the plans. The temporary traffic stripe tape shall be complete in place at the location shown prior to opening the traveled way to public traffic.

Removable traffic stripe tape shall be the temporary removable traffic stripe tape listed in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Removable traffic stripe tape shall be applied in conformance with the manufacturer's installation instructions and shall be rolled slowly with a rubber tired vehicle or roller to ensure complete contact with the pavement surface. Traffic stripe tape shall be applied straight on tangent alignment and on a true arc on curved alignment. Traffic stripe tape shall not be applied when the air or pavement temperature is less than 10°C, unless the installation procedures to be used are approved by the Engineer, prior to beginning installation of the tape.

When removable traffic stripe tape is specified for temporary left edgeline delineation, temporary pavement markers placed at longitudinal intervals of not more than 1.8 m may be used in place of the temporary traffic stripe tape. Temporary pavement markers shall be one of the types of temporary pavement markers listed for long term day/night use (6 months or less) in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. When temporary pavement markers are used in place of tape, payment for those temporary pavement markers will be made on the basis of the theoretical length of the temporary traffic stripe (tape) required for the left edgeline which the temporary pavement markers replace.

#### **TEMPORARY TRAFFIC STRIPE (PAINT)**

Temporary traffic stripe consisting of painted traffic stripe shall be applied and maintained at the locations shown on the plans. The painted temporary traffic stripe shall be complete in place at the location shown prior to opening the traveled way

to public traffic. Removal of painted temporary traffic stripe will not be required.

Temporary painted traffic stripe shall conform to the provisions in "Paint Traffic Stripes and Pavement Markings" of these special provisions, except for payment. At the option of the Contractor, either one or 2 coats shall be applied regardless of whether on new or existing pavement.

At the Contractor's option, temporary removable striping tape listed in "Prequalified and Tested Signing and Delineation Materials" of these special provisions may be used instead of painted temporary traffic stripes. When traffic stripe tape is used in place of painted temporary traffic stripes, the tape will be measured and paid for by the meter as temporary traffic stripe (paint).

When painted traffic stripe is specified for temporary left edgeline delineation, temporary pavement markers placed at longitudinal intervals of not more than 1.8 m may be used in place of the temporary painted traffic stripe. Temporary pavement markers shall be one of the types of temporary pavement markers listed for long term day/night use (6 months or less) in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. When temporary reflective pavement markers are used in place of temporary painted traffic stripe, payment for those temporary pavement markers will be made on the basis of the theoretical quantity of temporary traffic stripe (paint) required for the left edgeline the temporary pavement markers replace.

#### **TEMPORARY PAVEMENT MARKING (PAINT)**

Temporary pavement marking consisting of painted pavement marking shall be applied and maintained at the locations shown on the plans. The painted temporary pavement marking shall be complete in place at the location shown prior to opening the traveled way to public traffic. Removal of painted temporary pavement marking will not be required.

Temporary painted pavement marking shall conform to the provisions in "Paint Traffic Stripes and Pavement Markings" of these special provisions, except for payment. At the option of the Contractor, either one or 2 coats shall be applied regardless whether on new or existing pavement.

At the Contractor's option, temporary removable pavement marking tape or permanent pavement marking tape listed in "Prequalified and Tested Signing and Delineation Materials" of these special provisions may be used instead of painted temporary pavement markings. When pavement marking tape is used, regardless of which type of tape is placed, the tape will be measured and paid for by the square meter as temporary pavement marking (paint).

#### **TEMPORARY PAVEMENT MARKERS**

Temporary pavement markers shall be applied at the locations shown on the plans. The pavement markers shall be applied complete in place at the locations shown prior to opening the traveled way to public traffic.

Temporary pavement markers shown on the plans shall be, at the option of the Contractor, one of the temporary pavement markers for long term day/night use (6 months or less) listed in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Temporary pavement markers shall be placed in conformance with the manufacturer's instructions and shall be cemented to the surfacing with the adhesive recommended by the manufacturer, except epoxy adhesive shall not be used in areas where removal of the pavement markers will be required.

Where the temporary pavement delineation shown on the plans for lanelines or centerlines consists entirely of a pattern of broken traffic stripe and pavement markers, the Contractor may use groups of the temporary pavement markers for long term day/night use (6 months or less) in place of the temporary traffic stripe tape or painted temporary traffic stripe. The groups of pavement markers shall be spaced as shown on the plans for a similar pattern of permanent traffic line, except pavement markers shown to be placed in the gap between the broken traffic stripe shall be placed as part of the group to delineate the pattern of broken temporary traffic stripe. The kind of laneline and centerline delineation selected by the Contractor shall be continuous within a given location. Payment for those temporary pavement markers used in place of temporary traffic stripe will be made on the basis of the theoretical length of the patterns of temporary traffic stripe (tape) or temporary traffic stripe (paint).

Retroreflective pavement markers conforming to the provisions in "Pavement Markers" of these special provisions may be used in place of temporary pavement markers for long term day/night use (6 months or less) except to simulate patterns of broken traffic stripe. Placement of the retroreflective pavement markers used for temporary pavement markers shall conform to the provisions in "Pavement Markers" of these special provisions except the waiting period provisions before placing the pavement markers on new asphalt concrete surfacing as specified in Section 85-1.06, "Placement," of the Standard Specifications shall not apply and epoxy adhesive shall not be used to place pavement markers in areas where removal of the pavement markers will be required.

#### **MEASUREMENT AND PAYMENT**

Temporary traffic stripe (tape) will be measured and paid for by the meter, measured along the line of the stripe, with deductions for gaps in broken traffic stripes. Double and 200-mm temporary traffic stripes, shown on the plans as tape, will

be measured as 2 temporary traffic stripes (tape).

Temporary traffic stripe (paint) and temporary pavement marking (paint) will be measured and paid for in the same manner specified for paint traffic stripe (1-coat) and paint pavement marking (1-coat) in Section 84-3.06, "Measurement," and Section 84-3.07, "Payment," of the Standard Specifications.

Temporary pavement markers, shown on the plans, will be measured and paid for by the unit in the same manner specified for retroreflective pavement markers in Section 85-1.08, "Measurement," and Section 85-1.09, "Payment," of the Standard Specifications. Temporary pavement markers used for temporary laneline and centerline delineation for areas which are not shown on the plans will not be included in the quantities of temporary pavement markers to be paid for. Full compensation for removing temporary pavement markers, when no longer required, shall be considered as included in the contract unit price paid for temporary pavement marker and no separate payment will be made therefor.

The contract price paid per meter for temporary traffic stripe (tape) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying, maintaining and removing temporary traffic stripe tape, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **10-1.18 BARRICADE**

Barricades shall be furnished, placed and maintained at the locations shown on the plans, specified in the Standard Specifications or in these special provisions or where designated by the Engineer. Barricades shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Attention is directed to "Prequalified and Tested Signing and Delineation Materials" of these special provisions regarding retroreflective sheeting for barricades.

Sign panels for construction area signs and marker panels installed on barricades shall conform to the provisions in Section 12-3.06A, "Stationary Mounted Signs," of the Standard Specifications.

Full compensation for furnishing, installing, maintaining, and removing construction area signs and marker panels on barricades shall be considered as included in the contract unit price paid for the type of barricade involved and no separate payment will be made therefor.

Barricades shown on the plans as part of a traffic control system will be paid for as provided in "Traffic Control System for Lane Closure" of these special provisions and will not be included in the count for payment of barricades.

#### **10-1.19 CHANNELIZER**

Channelizers shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Channelizers shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

When no longer required for the work as determined by the Engineer, channelizers and underlying adhesive used to cement the channelizer bases to the pavement shall be removed. Removed channelizers and adhesive shall become the property of the Contractor and shall be removed from the site of work.

#### **10-1.20 TRAFFIC PLASTIC DRUMS**

Traffic plastic drums shall conform to the requirements for traffic control devices in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Traffic plastic drums shall be constructed of low-density polyethylene material and shall be flexible or collapsible upon impact by a vehicle. The traffic plastic drum shall have a weighted base that will separate from the drum. The base shall be of such shape as to preclude rolling upon impact by a vehicle. The base shall be of sufficient weight to maintain the drum in position and upright. The base or external ballast rings shall not exceed 101.6 mm in height, and drum rings shall not exceed 965.2 mm maximum in diameter. The base or external rings placed over and around the drum, resting on the pavement or ground shall contain the ballast for the drums. Ballast for drums shall be sand or water, except sand shall be used in areas susceptible to freezing. The base shall have drain holes to prevent the accumulation of water. Sand bags shall not be used as ballast for drums.

The body of the traffic plastic drum shall be of a fluorescent orange or predominately orange color. Drums shall be a minimum of 914.4 mm in height above the traveled way, and have at least an 457.2 mm minimum width, regardless of orientation.

The markings on drums shall be horizontal, circumferential, alternating orange and white reflective bands 101.6 to 152.4 mm wide. Each drum shall have a minimum of 2 orange and 2 white bands. The top of the uppermost reflective band shall be no lower than 152.4 mm from the top of the drum. Any non-reflective spaces between the bands shall not exceed 50.8 mm in width. The reflective sheeting shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials," elsewhere in these special provisions.

Only one type of traffic plastic drum shall be used on the project. The type of traffic plastic drum proposed for use on the project shall be submitted to the Engineer for approval, prior to placement on the project.

In curvilinear alignment traffic plastic drums shall be used only on one side of the traveled way. Traffic plastic drums shall be placed on the alignment and location shown on the plans, or directed by the Engineer. Traffic plastic drums shall be placed uniformly, straight on tangent alignment and on a true arc on curved alignment. All layout work necessary to place the traffic plastic drums to the proper alignment shall be performed by the Contractor.

If traffic plastic drums are displaced or are not in an upright position, from any cause, the traffic plastic drums shall immediately be replaced or restored to their original location, in an upright position, by the Contractor.

At the option of the Contractor, where portable delineators, cones or Type I or II barricades are specified in the specifications or shown on the plans, traffic plastic drums may be used in place of those portable delineators, cones or Type I or II barricades.

At the completion of the project, traffic plastic drums shall become the property of the Contractor and removed from the site of the work.

Traffic plastic drums will be measured as units from actual count of the number of traffic plastic drum designated on the plans or ordered by the Engineer. After initial placement of traffic plastic drums, and if ordered by the Engineer, the traffic plastic drums shall be moved from location to location and the cost thereof will be paid for as extra work as provided in Section 4-1.03D. Traffic plastic drums which are used as part of traffic control system in place of cones, delineators or barricades or which are used in accordance with the requirements of "Public Safety" elsewhere in these special provisions or which are placed in excess of the number specified or shown will not be included in the count of traffic plastic drums to be paid for.

The contract unit price paid for traffic plastic drum shall include full compensation for furnishing all labor, materials (including ballast), tools, equipment, and incidentals, and for doing all the work involved in furnishing, placing, maintaining, repairing, replacing and removing the traffic plastic drum, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **10-1.21 PORTABLE CHANGEABLE MESSAGE SIGN**

Portable changeable message signs will be furnished to the Contractor at the Roseville Corporation Yard located at 2005 Hilltop Circle. The Contractor shall notify the Engineer not less than 48 hours before the portable changeable message signs are to be picked up by the Contractor.

Portable changeable message signs shall be placed, operated, and maintained during each lane, ramp, shoulder closure, detour as shown on the traffic handling plans, and detour to preceding/next ramp at those locations approved by the Engineer or where designated by the Engineer in conformance with the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

The number of portable message signs required at any one time will be determined by the number of lane, ramp, shoulder closures, detour as shown on the plans, and detour to preceding or next ramp required for the Contractor's operations.

Portable changeable message signs will be paid for on a lump sum basis.

The contract lump sum price paid for portable changeable message sign shall include full compensation for furnishing all labor, tools, and incidentals, and for doing all work involved in placing, maintaining, repairing, replacing, changing message daily as requested by the Engineer, transporting from location to location, and returning the portable changeable message signs in good condition to the City of Roseville Corporation Yard located at 2005 Hilltop Circle, complete in place, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Attention is directed to "Maintaining Traffic" of these special provisions regarding the use of the portable changeable message signs.

#### **10-1.22 TEMPORARY RAILING**

Temporary railing (Type K) shall be placed as shown on the plans, as specified in the Standard Specifications or these special provisions or where ordered by the Engineer and shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Reflectors on temporary railing (Type K) shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Temporary railing (Type K) shall conform to the details shown on Standard Plan T3. Temporary railing (Type K) fabricated prior to January 1, 1993, and conforming to 1988 Standard Plan B11-30 may be used, provided the fabrication date is printed on the required Certificate of Compliance.

Attention is directed to "Public Safety" and "Order of Work" of these special provisions.

Temporary railing (Type K) placed in conformance with the provisions in "Public Safety" of these special provisions will be neither measured nor paid for.



### 10-1.23 TEMPORARY CRASH CUSHION MODULE

This work shall consist of furnishing, installing, and maintaining sand filled temporary crash cushion modules in groupings or arrays at each location shown on the plans, as specified in these special provisions or where designated by the Engineer. The grouping or array of sand filled modules shall form a complete sand filled temporary crash cushion in conformance with the details shown on the plans and these special provisions.

Attention is directed to "Public Safety", "Order of Work", and "Temporary Railing" of these special provisions.

Whenever the work or the Contractor's operations establishes a fixed obstacle, the exposed fixed obstacle shall be protected with a sand filled temporary crash cushion. The sand filled temporary crash cushion shall be in place prior to opening the lanes adjacent to the fixed obstacle to public traffic.

Sand filled temporary crash cushions shall be maintained in place at each location, including times when work is not actively in progress. Sand filled temporary crash cushions may be removed during a work period for access to the work provided that the exposed fixed obstacle is 4.6 m or more from a lane carrying public traffic and the temporary crash cushion is reset to protect the obstacle prior to the end of the work period in which the fixed obstacle was exposed. When no longer required, as determined by the Engineer, sand filled temporary crash cushions shall be removed from the site of the work.

At the Contractor's option, the modules for use in sand filled temporary crash cushions shall be either Energite III Inertial Modules, Fitch Inertial Modules or TraFFix Sand Barrels manufactured after March 31, 1997, or equal:

- A. Energite III and Fitch Inertial Modules, manufactured by Energy Absorption Systems, Inc., One East Wacker Drive, Chicago, IL 60601-2076. Telephone 1-312-467-6750, FAX 1-800-770-6755
  - 1. Distributor (North): Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828. Telephone 1-800-884-8274, FAX 1-916-387-9734
  - 2. Distributor (South): Traffic Control Service, Inc., 1881 Betmor Lane, Anaheim, CA 92805. Telephone 1-800-222-8274, FAX 1-714-937-1070
- B. TraFFix Sand Barrels, manufactured by TraFFix Devices, Inc., 220 Calle Pintesresco, San Clemente, CA 92672. Telephone 1-949 361-5663, FAX 1-949 361-9205
  - 1. Distributor (North): United Rentals, Inc., 1533 Berger Drive, San Jose, CA 95112. Telephone 1-408 287-4303, FAX 1-408 287-1929
  - 2. Distributor (South): Statewide Safety & Sign, Inc., P.O. Box 1440, Pismo Beach, CA 93448. Telephone 1-800-559-7080, FAX 1-805 929-5786

Modules contained in each temporary crash cushion shall be of the same type at each location. The color of the modules shall be the standard yellow color, as furnished by the vendor, with black lids. The modules shall exhibit good workmanship free from structural flaws and objectionable surface defects. The modules need not be new. Good used undamaged modules conforming to color and quality of the types specified herein may be utilized. If used Fitch modules requiring a seal are furnished, the top edge of the seal shall be securely fastened to the wall of the module by a continuous strip of heavy duty tape.

Modules shall be filled with sand in conformance with the manufacturer's directions, and to the sand capacity in kilograms for each module shown on the plans. Sand for filling the modules shall be clean washed concrete sand of commercial quality. At the time of placing in the modules, the sand shall contain not more than 7 percent water as determined by California Test 226.

Modules damaged due to the Contractor's operations shall be repaired immediately by the Contractor at the Contractor's expense. Modules damaged beyond repair, as determined by the Engineer, due to the Contractor's operations shall be removed and replaced by the Contractor at the Contractor's expense.

Temporary crash cushion modules shall be placed on movable pallets or frames conforming to the dimensions shown on the plans. The pallets or frames shall provide a full bearing base beneath the modules. The modules and supporting pallets or frames shall not be moved by sliding or skidding along the pavement or bridge deck.

A Type R or P marker panel shall be attached to the front of the crash cushion as shown on the plans, when the closest point of the crash cushion array is within 3.6 m of the traveled way. The marker panel, when required, shall be firmly fastened to the crash cushion with commercial quality hardware or by other methods determined by the Engineer.

At the completion of the project, temporary crash cushion modules, sand filling, pallets or frames, and marker panels shall become the property of the Contractor and shall be removed from the site of the work. Temporary crash cushion modules shall not be installed in the permanent work.

Temporary crash cushion modules will be measured by the unit as determined from the actual count of modules used in

the work or ordered by the Engineer at each location. Temporary crash cushion modules placed in conformance with the provisions in "Public Safety" of these special provisions and modules placed in excess of the number specified or shown will not be measured nor paid for.

Repairing modules damaged by public traffic will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications. Modules damaged beyond repair by public traffic, when ordered by the Engineer, shall be removed and replaced immediately by the Contractor. Modules replaced due to damage by public traffic will be measured and paid for as temporary crash cushion module.

If the Engineer orders a lateral move of the sand filled temporary crash cushions and the repositioning is not shown on the plans, moving the sand filled temporary crash cushion will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications and these temporary crash cushion modules will not be counted for payment in the new position.

The contract unit price paid for temporary crash cushion module shall include full compensation for furnishing all labor, materials (including sand, pallets or frames and marker panels), tools, equipment, and incidentals, and for doing all the work involved in furnishing, installing, maintaining, moving, and resetting during a work period for access to the work, and removing from the site of the work when no longer required (including those damaged by public traffic) sand filled temporary crash cushion modules, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **10-1.24 EXISTING HIGHWAY FACILITIES**

The work performed in connection with various existing highway facilities shall conform to the provisions in Section 15, "Existing Highway Facilities," of the Standard Specifications and these special provisions.

Except as otherwise provided for damaged materials in Section 15-2.04, "Salvage," of the Standard Specifications, the materials to be salvaged shall remain the property of the State, and shall be cleaned, packaged, bundled, tagged, and hauled to the District Regional Recycle Center at Willows Maintenance Station at 939 North Humboldt Avenue, Willows, CA 95988 and stockpiled.

The Contractor shall notify the Engineer and the District Regional Recycle Coordinator, telephone (530) 934-5148 a minimum of 48 hours prior to hauling salvaged material to the Recycle Center.

#### **ABANDON CULVERT**

Existing culverts, where shown on the plans to be abandoned, shall be abandoned in place or, at the option of the Contractor, the culverts shall be removed and disposed of. Resulting openings into existing structures that are to remain in place shall be plugged with commercial quality concrete containing not less than 300 kg of cement per cubic meter.

Abandoning culverts in place shall conform to the following:

- A. Culverts and that intersect the side slopes shall be removed to a depth of not less than one meter measured normal to the plane of the finished side slope, before being abandoned.
- B. Culverts 300 mm in diameter and larger, shall, at the Contractor's option, be backfilled with either sand, controlled low strength material or slurry cement backfill conforming to the provisions in Section 19-3.062, "Slurry Cement Backfill," of the Standard Specifications by any method acceptable to the Engineer that completely fills the pipe. Sand backfill material shall be clean, free draining, and free from roots and other deleterious substances.
- C. The ends of culverts shall be securely closed by a 150 mm thick tight fitting plug or wall of commercial quality concrete.

Culverts shall not be abandoned until their use is no longer required. The Contractor shall notify the Engineer in advance of any intended culvert or pipeline abandonment.

Full compensation for concrete plugs, pipe removal, structure excavation, and backfill (including sand, controlled low strength material or slurry cement backfill) shall be considered as included in the contract unit price paid for abandon culvert and no additional compensation will be allowed therefor.

#### **REMOVE METAL BEAM GUARD RAILING**

Existing metal beam guard railing, where shown on the plans to be removed, shall be removed and disposed of.

Full compensation for removing cable anchor assemblies, terminal anchor assemblies or steel foundation tubes shall be considered as included in the contract price paid per meter for remove metal beam guard railing and no separate payment will be made therefor.

#### **REMOVE PAVEMENT MARKER**

Existing pavement markers, including underlying adhesive, when no longer required for traffic lane delineation as

determined by the Engineer, shall be removed and disposed of.

Full compensation for removing and disposing of pavement markers and underlying adhesive shall be considered as included in the contract price paid per tonne for asphalt concrete (Type A) and asphalt concrete (open graded) and no separate payment will be made therefor.

### **REMOVE TRAFFIC STRIPE**

Traffic stripe shall be removed at the locations shown on the plans and as directed by the Engineer.

Attention is directed to "Water Pollution Control" of these special provisions.

Waste from removal of yellow thermoplastic and yellow painted traffic stripe contains lead chromate in average concentrations greater than or equal to 5 mg/L Soluble Lead or 1000 mg/kg Total Lead. Yellow thermoplastic and yellow painted traffic stripe exist from "S" Station 10+00 to Station 14+78.4. Residue produced from when yellow thermoplastic and yellow paint are removed may contain heavy metals in concentrations that exceed thresholds established by the California Health and Safety Code and may produce toxic fumes when heated.

The removed yellow thermoplastic and yellow paint shall be disposed of at a Class 1 disposal facility or a Class 2 disposal facility permitted by the Regional Water Quality Control Board in conformance with the requirements of the disposal facility operator within 14 days after accumulating 100 kg of residue and dust. The Contractor shall make necessary arrangements with the operator of the disposal facility to test the yellow thermoplastic and yellow paint residue as required by the facility and these special provisions. Testing shall include, at a minimum, (1) Total Lead and Chromium by EPA Method 7000 series and (2) Soluble Lead and Chromium by California Waste Extraction Test. From the first 3360 L of waste or portion thereof, if less than 3360 L of waste are produced, a minimum of four randomly selected samples shall be taken and analyzed. From each additional 840 L of waste or portion thereof, if less than 840 L are produced, a minimum of one additional random sample shall be taken and analyzed. The Contractor shall submit the name and location of the disposal facility and analytical laboratory along with the testing requirements to the Engineer not less than 14 days prior to the start of removal of yellow thermoplastic and yellow painted traffic stripe. The analytical laboratory shall be certified by the Department of Health Services Environmental Laboratory Accreditation Program. Test results shall be provided to the Engineer for review prior to signing a waste profile as requested by the disposal facility, prior to issuing an EPA identification number, and prior to allowing removal of the waste from the site.

The Contractor shall prepare a project specific Lead Compliance Plan to prevent or minimize worker exposure to lead while handling removed yellow thermoplastic and yellow paint residue. Attention is directed to Title 8, California Code of Regulations, Section 1532.1, "Lead," for specific Cal-OSHA requirements when working with lead.

The Lead Compliance Plan shall contain the elements listed in Title 8, California Code of Regulations, Section 1532.1(e)(2)(B). Before submission to the Engineer, the Lead Compliance Plan shall be approved by an Industrial Hygienist certified in Comprehensive Practice by the American Board of Industrial Hygiene. The Plan shall be submitted to the Engineer at least 7 days prior to beginning removal of yellow thermoplastic and yellow paint.

Prior to removing yellow thermoplastic and yellow painted traffic stripe, personnel who have no prior training, including State personnel, shall complete a safety training program provided by the Contractor that meets the requirements of Title 8, California Code of Regulations, Section 1532.1, "Lead," and the Contractor's Lead Compliance Program.

Personal protective equipment, training, and washing facilities required by the Contractor's Lead Compliance Plan shall be supplied to State personnel by the Contractor. The number of State personnel will be 6.

Where grinding or other methods approved by the Engineer are used to remove yellow thermoplastic and yellow painted traffic stripe, the removed residue, including dust, shall be contained and collected immediately. Sweeping equipment shall not be used. Collection shall be by a high efficiency particulate air (HEPA) filter equipped vacuum attachment operated concurrently with the removal operations or other equally effective methods approved by the Engineer. The Contractor shall submit a written work plan for the removal, storage, and disposal of yellow thermoplastic and yellow painted traffic stripe to the Engineer for approval not less than 14 days prior to the start of the removal operations. Removal operations shall not be started until the Engineer has approved the work plan.

The removed yellow thermoplastic and yellow painted traffic stripe residue shall be stored and labeled in covered containers. Labels shall conform to the provisions of Title 22, California Code of Regulations, Sections 66262.31 and 66262.32. Labels shall be marked with date when the waste is generated, the words "Hazardous Waste", composition and physical state of the waste (for example, asphalt grindings with thermoplastic or paint), the word "Toxic", the name and address of the Engineer, the Engineer's telephone number, contract number, and Contractor or subcontractor. The containers shall be a type approved by the United States Department of Transportation for the transportation and temporary storage of the removed residue. The containers shall be handled so that no spillage will occur. The containers shall be stored in a secured enclosure at a location within the project limits until disposal, as approved by the Engineer.

If the yellow thermoplastic and yellow painted traffic stripe residue is transported to a Class 1 disposal facility, a manifest shall be used, and the transporter shall be registered with the California Department of Toxic Substance Control. The Engineer will obtain the United States Environmental Protection Agency Identification Number and sign all manifests as

the generator within 2 working days of receiving sample test results and approving the test methods.

The Contractor shall assume that the yellow paint removed is not regulated under the Federal Resource Conservation and Recovery Act (RCRA). Additional disposal costs for removal residue regulated under RCRA, as determined by test results required by the disposal facility, will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

Nothing in these special provisions shall relieve the Contractor of the Contractor's responsibilities as specified in Section 7-1.09, "Public Safety," of the Standard Specifications.

The contract lump sum price paid for Lead Compliance Plan shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in preparing the Lead Compliance Plan, including paying the Certified Industrial Hygienist, and for providing personnel protective equipment, training, air monitoring, and medical surveillance, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for providing a written work plan for the removal, storage, and disposal of yellow thermoplastic and yellow painted traffic stripe shall be considered as included in the contract item paid per meter for remove yellow traffic stripe and no separate payment will be made therefor.

### **REMOVE ROADSIDE SIGN**

Existing roadside signs, at those locations shown on the plans to be removed, shall be removed and disposed of.

Existing roadside signs shall not be removed until replacement signs have been installed or until the existing signs are no longer required for the direction of public traffic, unless otherwise directed by the Engineer.

### **REMOVE SIGN STRUCTURE**

Existing sign structures, where shown on the plans to be removed, shall be removed and disposed of.

Overhead sign structure removal shall consist of removing posts, frames, portions of foundations, sign panels, walkways with safety railings, and sign lighting electrical equipment.

Bridge mounted sign structure removal shall consist of removing sign panels and frames, sign lighting electrical equipment, walkways with safety railings, structural braces and supports, and hardware.

A sign structure shall not be removed until the structure is no longer required for the direction of public traffic.

Concrete foundations may be abandoned in place, except that the top portion, including anchor bolts, reinforcing steel, and conduits shall be removed to a depth of not less than 0.9 m below the adjacent finished grade. The resulting holes shall be backfilled and compacted with material equivalent to the surrounding material.

Electrical wiring shall be removed to the nearest pull box. Fuses within spliced connections in the pull box shall be removed and disposed of.

Electrical equipment, where shown on the plans, shall be salvaged.

### **REMOVE DRAINAGE FACILITY**

Existing culverts, inlets flared end sections, manholes, and headwalls, where any portion of these structures is within one meter of the grading plane in excavation areas, or within 0.3-m of original ground in embankment areas, or where shown on the plans to be removed, shall be completely removed and disposed of.

### **REMOVE RETAINING WALL**

Existing retaining wall, where shown on the plans to be removed, shall be removed and disposed of.

Resulting holes and depressions shall be backfilled with earthy material selected from excavation to the lines and grade established by the Engineer.

Graded areas resulting from the wall removal shall be resoded as directed by the Engineer.

Removing retaining wall will be measured by the meter, measured along the retaining wall before removal operations.

Material removed from the retaining wall shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Full compensation for resoding graded areas resulting from the wall removal shall be considered as included in the contract price paid per meter for remove retaining wall and no additional compensation will be allowed therefor.

### **REMOVE BASE AND SURFACING**

Existing base and bituminous surfacing shown on the plans to be removed, shall be removed to a depth of at least 150 mm below the grade of the existing surfacing. Resulting holes and depressions shall be backfilled with earthy material selected from excavation to the lines and grade established by the Engineer.

The material removed shall be disposed of outside the highway right of way in conformance with the provisions in

Section 15-2.03, "Disposal," of the Standard Specifications.

Removing base and surfacing will be measured by the cubic meter in the same manner specified for roadway excavation in conformance with the provisions in Section 19, "Earthwork," of the Standard Specifications and will be paid for at the contract price per cubic meter for remove base and surfacing.

#### **RELOCATE ROADSIDE SIGN**

Existing roadside signs shall be removed and relocated to the new locations shown on the plans.

Each roadside sign shall be installed at the new location on the same day that the sign is removed from its original location.

Two holes shall be drilled in each existing post as required to provide the breakaway feature shown on the plans.

#### **COLD PLANE ASPHALT CONCRETE PAVEMENT**

Existing asphalt concrete pavement shall be cold planed at the locations and to the dimensions shown on the plans.

Planing asphalt concrete pavement shall be performed by the cold planing method. Planing of the asphalt concrete pavement shall not be done by the heater planing method.

Cold planing machines shall be equipped with a cutter head not less than 750 mm in width and shall be operated so that no fumes or smoke will be produced. The cold planing machine shall plane the pavement without requiring the use of a heating device to soften the pavement during or prior to the planing operation.

The depth, width, and shape of the cut shall be as shown on the typical cross sections or as designated by the Engineer. The final cut shall result in a uniform surface conforming to the typical cross sections. The outside lines of the planed area shall be neat and uniform. Planing asphalt concrete pavement operations shall be performed without damage to the surfacing to remain in place.

Planed widths of pavement shall be continuous except for intersections at cross streets where the planing shall be carried around the corners and through the conform lines. Following planing operations, a drop-off of more than 45 mm will not be allowed between adjacent lanes open to public traffic.

Where transverse joints are planed in the pavement at conform lines no drop-off shall remain between the existing pavement and the planed area when the pavement is opened to public traffic. If asphalt concrete has not been placed to the level of existing pavement before the pavement is to be opened to public traffic a temporary asphalt concrete taper shall be constructed. Asphalt concrete for temporary tapers shall be placed to the level of the existing pavement and tapered on a slope of 1:30 (Vertical: Horizontal) or flatter to the level of the planed area.

Asphalt concrete for temporary tapers shall be commercial quality and may be spread and compacted by any method that will produce a smooth riding surface. Temporary asphalt concrete tapers shall be completely removed, including the removal of loose material from the underlying surface, before placing the permanent surfacing. The removed material shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

The material planed from the roadway surface, including material deposited in existing gutters or on the adjacent traveled way, shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications. Removal operations of cold planed material shall be concurrent with planing operations and follow within 15 m of the planer, unless otherwise directed by the Engineer.

Cold plane asphalt concrete pavement will be measured by the square meter. The quantity to be paid for will be the actual area of surface cold planed irrespective of the number of passes required to obtain the depth shown on the plans.

The contract price paid per square meter for cold plane asphalt concrete pavement shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in cold planing asphalt concrete surfacing and disposing of planed material, including furnishing the asphalt concrete for and constructing, maintaining, removing, and disposing of temporary asphalt concrete tapers, as specified in the Standard Specifications and these special provisions and as directed by the Engineer.

#### **EXISTING LOOP DETECTORS**

The existing inductive loop detectors shown on the plans shall remain in place while existing signals are to be operative prior to their removal.

If part of the loop conductor, including the portion leading to the adjacent pull box, is damaged by the Contractor's operations, the entire detector loop shall be replaced at the Contractor's expense. Adjacent loops damaged during the replacement shall also be replaced.

#### **REMOVE CONCRETE**

Concrete, where shown on the plans to be removed, shall be removed.

The pay quantities of concrete curb and concrete sidewalk, to be removed will be measured by the cubic meter, measured before and during removal operations.

Removing concrete barrier, will be measured by the meter, measured along the barrier before removal operations.

Concrete removed shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

#### **10-1.25 CLEARING AND GRUBBING**

Clearing and grubbing shall conform to the provisions in Section 16, "Clearing and Grubbing," of the Standard Specifications and these special provisions.

Existing trees, where shown on the plans to be removed, shall be cleared and grubbed. Holes resulting from the removal of the trees shall be backfilled the same day the trees are removed and disposed of. Soil from the surrounding area may be used to backfill these holes. The backfill shall be graded to conform with the adjacent existing grade.

Vegetation shall be cleared and grubbed only within the excavation and embankment slope lines.

At locations where there is no grading adjacent to a bridge or other structure, clearing and grubbing of vegetation shall be limited to 1.5 m outside the physical limits of the bridge or structure.

Existing vegetation outside the areas to be cleared and grubbed shall be protected from injury or damage resulting from the Contractor's operations.

Activities controlled by the Contractor, except cleanup or other required work, shall be confined within the graded areas of the roadway.

Nothing herein shall be construed as relieving the Contractor of the Contractor's responsibility for final cleanup of the highway as provided in Section 4-1.02, "Final Cleaning Up," of the Standard Specifications.

#### **10-1.26 WATERING**

Developing a water supply and applying watering shall conform to the provisions in Section 17, "Watering," of the Standard Specifications and these special provisions.

The City of Roseville has made available to the Contractor the use of their fire hydrants as a source of water for use on this project. If the Contractor elects to use this source of water then the Contractor shall be responsible for obtaining a permit and pay all fees to draw potable water from city fire hydrants for water supply. The Contractor may obtain the permit from the Roseville Environmental Utility Department located at 2005 Hilltop Circle, Roseville California at (916) 774-5770 for each hydrant used.

#### **10-1.27 EARTHWORK**

Earthwork shall conform to the provisions in Section 19, "Earthwork," of the Standard Specifications and these special provisions.

Surplus excavated material shall become the property of the Contractor and shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Where a portion of the existing surfacing is to be removed, the outline of the area to be removed shall be cut on a neat line with a power-driven saw to a minimum depth of 50 mm before removing the surfacing. Full compensation for cutting the existing surfacing shall be considered as included in the contract price paid per cubic meter for roadway excavation and no additional compensation will be allowed therefor.

Reinforcement or metal attached to reinforced concrete rubble placed in embankments shall not protrude above the grading plane. Prior to placement within 0.6-m below the grading plane of embankments, reinforcement or metal shall be trimmed to no greater than 20 mm from the face of reinforced concrete rubble. Full compensation for trimming reinforcement or metal shall be considered as included in the contract prices paid per cubic meter for the types of excavation shown in the Engineer's estimate, or the contract prices paid for furnishing and placing imported borrow or embankment material, as the case may be, and no additional compensation will be allowed therefor.

At the locations and to the limits shown on the plans, where structural backfill is required below the foundations of operation building, backfill material shall consist of Class 2 aggregate base material in conformance with the placing and compacting requirements for structure backfill. The relative compaction shall be not less than 95 percent.

At the locations and to the limits shown on the plans, material below the bottom of retaining wall footings shall be removed and replaced with Class 2 aggregate base material in conformance with the placing and compacting requirements for structure backfill. The relative compaction shall be not less than 95 percent. Removal of the material will be measured and paid for by the cubic meter as structure excavation (retaining wall) and furnishing, placing, and compacting the replacement material will be measured and paid for by the cubic meter as structure backfill (retaining wall).

At the footings where material is removed and replaced, as described herein, a relative compaction of not less than 95 percent shall be obtained for a minimum depth of 150 mm below the bottom of excavation.

Slurry cement backfill shall conform with the provisions in Section 19-3.062, "Slurry Cement Backfill," of the Standard

Specifications and these special provisions. Slurry cement backfill for the portal walls of the "Sunrise-E80 On Ramp Tunnel," placed at the locations and to the limits shown on the plans will be measured and paid for by the cubic meter as structure backfill (slurry cement).

### **TUNNEL AND PORTAL EXCAVATION**

The walls for the pumping plant storage box (sump) shall be strutted prior to backfilling. Struts shall conform to the requirements for falsework elsewhere in these special provisions. Backfilling shall be placed uniformly on all side of the box to equalize wall pressures. Struts shall remain in place until the tunnel bottom slab over the storage box is complete and concrete in that portion has attained a minimum compressive strength of 18 MPa.

Backfill placed behind tunnel walls shall not be placed until the top slab of tunnel is in place. Backfill behind tunnel walls shall be placed uniformly on both sides of the tunnel to equalize wall pressures.

Backfill, including behind portal walls shall not be placed until concrete for all of the interior walls and slabs for the respective portal has attained a minimum compressive strength of 18 MPa.

Control of ground water and surface drainage at the tunnel excavation shall conform to provisions in Section 19-3.04, "Water Control and Foundation Treatment," of the Standard Specifications and these special provisions.

At the Contractor's option, steel shoring, steel and timber lagging, steel casings, steel liners, and other steel bracing placed to support the tunnel and portal excavation may remain in place, subject to the following requirements:

- A. Bracing shall be placed in an open type arrangement with ample clearance between adjacent braces to permit the ready flow of concrete around the bracing and provide proper clearance to the reinforcement.
- B. Steel casings, liners, and lagging shall be outside of the neat lines of the tunnel and portals.
- C. Timber lagging that is left in place must be treated. All untreated timber lagging must be removed. Treatment of timber lagging to be left in place shall conform to the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," of the Standard Specifications.
- D. Cross struts or bracing will not be permitted to remain within any tunnel wall or slab concrete. Any resulting voids that occur from removal of struts or bracing shall be filled with concrete of the same mix, compaction, and finish, including membrane waterproofing.

### **DEWATERING**

Dewatering operations shall maintain water levels 0.3 meter below bottom of bottom slab elevations until all concrete construction within the limits of the respective segment of tunnel or portal has attained a minimum compressive strength of 18 MPa.

Water from the de-watering process shall be directed into the Roseville City sanitary sewer system at the location shown on the plans. The shoring and cofferdam drawings shall define how the connection will be made to the City sanitary sewer system.

The Contractor may elect to de-water the tunnel and portal excavations by the use of well points or by the use of open sumps within the tunnel excavations. The water from the de-watering process shall be pre-treated to remove suspended solids, as approved by the Engineer.

The pumping plant pumps shall not be used by the Contractor for dewatering excavations.

Should additional effort be required for pre-treatment and/or transporting of groundwater due to the presence of hazardous levels of petroleum hydrocarbons in the water, as defined in these special provisions, the additional cost thereof will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

Full compensation for the pre-treatment to remove suspended solids shall be considered as included in the contract unit price paid per cubic meter for structure excavation (Tunnel) (Type D) and no additional compensation will be allowed therefor.

Structure excavation and backfill for the pumping plant structure will be measured and paid for as structure excavation (Tunnel) (Type D) and structure backfill (tunnel), respectively.

### **Monitoring Program**

Not less than 30 days before starting earthwork operations for the tunnel and portals, the Contractor shall furnish to the Engineer for review, plans and details in writing, of the proposed supports, protective devices, methods and procedures to be used for the tunnel and portal excavations. Said plans and details shall include a program to monitor all horizontal or vertical movement, including a photographic record, of facilities that may be affected by the work.

The monitoring program records shall show existing conditions and changes that occur during construction. The records shall show the precautions taken and results. The records shall include complaints and the investigation of complaints. Records shall be available to the Engineer.

Full compensation for conforming to the provisions in "Monitoring Program" shall be considered as included in the

contract prices paid for the various items of work involved and no additional compensation will be allowed therefor.

Pervious backfill material in connection with bridge work will be measured and paid for by the cubic meter as structure backfill (bridge).

Pervious backfill material within the limits of payment for retaining walls will be measured and paid for by cubic meter as structure backfill (retaining wall).

If structure excavation or structure backfill involved in bridges is not otherwise designated by type, and payment for the structure excavation or structure backfill has not otherwise been provided for in the Standard Specifications or these special provisions, the structure excavation or structure backfill will be paid for at the contract price per cubic meter for structure excavation (bridge) or structure backfill (bridge).

Structure excavation designated as (Type D), for footings at the locations shown on the plans, will be measured and paid for by the cubic meter as structure excavation (Type D). Ground water or surface water is expected to be encountered at these locations, but seal course concrete is not shown or specified. Structure excavation for footings at locations not designated on the plans as structure excavation (Type D), and where ground or surface water is encountered, will be measured and paid for by the cubic meter as structure excavation (bridge).

#### **10-1.28 STRUCTURE EXCAVATION (TUNNEL) (TYPE DH)**

##### **Scope**

Structure Excavation (Tunnel) (Type DH) shall conform to the provisions in Section 19, Earthwork, of the Standard Specifications.

Soil contamination is known to exist in the vicinity of the former underground storage tank (UST) area and in the vicinity of the former fuel dispensing area (STA 'T' 4+35 to 'T' 4+60). Maximum concentrations of soil contamination known to be present in soil are 128 mg/kg of Total Petroleum Hydrocarbons as Diesel (TPH-diesel), 438 mg/kg of TPH-gasoline, 0.472 mg/kg of benzene, and 0.594 mg/kg of Methyl Tertiary Butyl Ether (MTBE).

When excavated, this material may become classified as designated waste in accordance with the Central Valley Regional Water Quality Control Board. Excavated soil material that is classified as designated waste shall be relinquished to Chevron USA (Chevron) for transportation and off-site disposal. Soil determined to be clean shall become the property of the Contractor.

Chevron USA (Chevron) is the responsible party for the contaminated soil associated with the 251 Sunrise Avenue parcel and has ultimate legal authority regarding the management and disposition of this contaminated material. The Contractor is advised that the conditions set forth in this special provision is subject to final approval by Chevron. The Contractor shall adhere to the provisions set forth herein unless modified under mutual agreement with Caltrans.

A Problem Assessment Report has been completed which describes the contamination area. Copies of the report may be obtained at the Department of Transportation, Plans and Bid Documents, Room 0200, Transportation Building, 1120 N Street, P.O. Box 942874, Sacramento, California 94274-001, Telephone No. (916) 654-4490, and are available for inspection at the office of the District Director of Transportation at 379 Colusa Highway, Yuba City, California 95991. The applicable report is entitled Problem Assessment Report – Former Chevron 9-9839, 251 Sunrise Avenue, Roseville, California, prepared by SECOR International Incorporated, August 7, 2000.

##### **Applicable rules and regulations**

Excavation, stockpiling, transport and disposal of designated waste material shall be in accordance with the rules and regulations of the following agencies:

- Department of Toxic Substance Control (DTSC)
- Integrated Waste Management Board
- Regional Water Quality Control Board (RWQCB), Central Valley Region
- State Air Resources Board
- United States Department of Transportation (USDOT)
- United States Environmental Protection Agency (USEPA)
- California Environmental Protection Agency (CAL-EPA):
- California Division of Occupational Safety and Health Administration (CAL-OSHA)
- Placer County Department of Health and Human Services

##### **Permits and licenses**

The Contractor shall procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work. The California Environmental Quality Act (CEQA) of 1970 (Chapter



1433, States. 1970), as amended, may be applicable to permits, licenses and authorizations which the Contractor shall obtain from all agencies in connection with performing the work of the contract. The Contractor shall comply with the provisions of said statutes in obtaining such permits, licenses and other authorizations.

### **Health, safety and work plan**

The Contractor shall prepare a Health, Safety and Work Plan for site personnel. The Health, Safety and Work Plan shall include mandatory personal protective equipment, training, equipment decontamination procedures, spill plan, site clean up procedures, and physical barrier requirements in accordance with California Code of Regulations (CCR), Title 8. The Health, Safety and Work Plan shall include a description of the order of work, material handling, permit requirements, material segregation, stockpile locations, sampling protocols, transportation and disposal sites for petroleum hydrocarbon materials. The Health, Safety and Work Plan shall be submitted for review and acceptance by the Engineer at least 15 working days prior to beginning any excavation work. Prior to submittal, the Contractor shall have the Health, Safety, and Work Plan approved by a Certified Industrial Hygienist. If the plan is determined to be unacceptable, it will be returned, within 10 working days of submittal, to the Contractor for revision. The Contractor shall submit the revised plan to the Engineer at least 2 days prior to commencing excavation work. No work shall proceed until the plan is accepted by the Engineer. Prior to submittal, the Contractor shall have the Health, Safety and Work Plan for all excavation work approved by a California Certified Industrial Hygienist and a California Registered Civil Engineer. Non-reusable protective equipment, once used by any personnel, including State personnel, shall be collected and disposed of at an appropriate disposal site by the Contractor. Full compensation for preparation of Health, Safety, and Work Plan shall be considered as included in the contract price paid for Structure Excavation (Tunnel) (Type DH) and no additional compensation will be allowed therefor.

### **Safety training**

Prior to performing any excavation work, all personnel working on the project, including State Personnel, shall complete required training specified in the Contractor's compliance program covering the potential hazards as identified. Any required training shall be provided by the Contractor who shall provide a certification of the completion of the Safety Training Program for all personnel. Personal protective equipment required by the Contractor's Health, Safety and Work for personnel working on the project will also be supplied to State personnel by the Contractor. The number of State personnel requiring the above mentioned safety training program and personal protective equipment will be three (3). Full compensation for safety training shall be considered as included in the contract price paid for Structure Excavation (Tunnel) (Type DH) and no additional compensation will be allowed therefor.

### **Segregation of designated waste**

All excavated material between STA 'T' 4+35 and 'T' 4+60 shall be stockpiled in a fenced area on two layers of 10-mil thick (minimum) black polyethylene. Segregation of excavated material into two distinct stockpiles may be required in order to separate contaminated and non-contaminated material. The Engineer or designated representative shall provide direction regarding the placement of excavated material into either the contaminated or non-contaminated stockpiles. A perimeter berm for the stockpiles shall be constructed by wrapping the edges of the plastic over hay bales, or equivalent, to prevent contaminated water runoff and infiltration. The stockpiles shall be covered with one layer of 10-mil (minimum) black polyethylene at all times. The plastic shall be sufficiently weighted with sandbags to prevent wind damage to the plastic. The Contractor shall be responsible for protecting the stockpiles until such time material is relinquished to Chevron as mentioned below. Full compensation for segregation of designated waste material shall be considered as included in the contract price paid for Structure Excavation (Tunnel) (Type DH) and no additional compensation will be allowed therefor.

### **Sampling and analysis requirements**

All excavated material from the contamination site will be tested by Chevron with results provided within 5 working days. The Contractor shall collect split samples of all soil testing performed by Chevron and provide results to the Engineer within 5 working days. At a minimum, a split sample shall be collected for every 150 cubic meters of excavated soil from the contamination site.

If any of this material is found through testing to contain concentrations above 1.0 mg/kg of either TPH-diesel or TPH-gasoline; or concentrations above 5.0 µg/kg of either Benzene, Toluene, Ethylbenzene, or Xylene (BTEX); or concentrations above 5.0 µg/kg of MTBE, the material shall be considered a designated waste and shall immediately be relinquished to Chevron.

Chevron will transport and dispose of all designated waste material within 30 days after receipt of sample results. The material shall become the property of the Contractor if testing shows contaminant concentrations below those mentioned above. The Contractor's sampling and testing analysis shall be performed using sampling and testing analysis procedures

required by the regulatory agencies in the locality of the job. The laboratory used shall be certified by the California Department of Health Services for the required analyses.

Samples shall be analyzed for Total Petroleum Hydrocarbons as Diesel (TPH-D) and Gasoline (TPH-G) by EPA Test Method 8015M and BTEX by EPA Method 8021, and MTBE by EPA Test Method 8260B. Analytical reporting limits shall not exceed 1.0 mg/kg for TPH-diesel or TPH-gasoline or 5.0 µg/kg for BTEX and MTBE.

A letter report shall be prepared and signed by a California Registered Civil Engineer or Geologist and include, at a minimum, the volume of removed contaminated soil, sampling procedures, and laboratory analytical results.

#### **Payment**

The contract price paid per cubic meter for Structure Excavation (Tunnel) (Type DH) shall include full compensation for furnishing all labor, training, materials, tools, equipment, and incidentals, and for doing all the work involved in excavation within the contamination area including stockpiling, sorting the material into its' appropriate classification, sampling, testing, permitting, and providing a letter report as specified in these special provisions, and as directed by the Engineer.

#### **10-1.29 EARTH RETAINING STRUCTURES**

Earth retaining structures, consisting of mechanically stabilized embankment, shall conform to the details shown on the plans and these special provisions.

At the Contractor's option, one of the following acceptable alternative earth retaining systems may be constructed:

Proprietary Earth Retaining System	Address and Phone Number
Reinforced Earth	The Reinforced Earth Company 20381 Lake Forest Drive, Suite B-2 Lake Forest, CA 92630 (949) 587-3060 <a href="http://www.reinforcedearth.com">www.reinforcedearth.com</a>
Retained Earth (1.52-meter square concrete face panels)	Foster Geotechnical 1660 Hotel Circle North - Suite 304 San Diego, CA 92108 (619) 688-2400 <a href="http://www.lbfoster.com">www.lbfoster.com</a>
Welded Wire Wall	Hilfiker Retaining Walls P.O. Box 2012 Eureka, CA 95502-2012 (707) 443-5093 <a href="http://www.hilfiker.com">www.hilfiker.com</a>
MSE Plus	SSL 4740 Scotts Valley Drive, Suite "E" Scotts Valley, CA 95066 (831) 430-9300

Only one type of earth retaining system shall be used for both mechanically stabilized embankment retaining walls associated with the Douglas – Sunrise Connector Overcrossing.

The above list of acceptable alternative earth retaining systems has been selected from the Department's current list of prequalified earth retaining systems and is limited only to those systems determined to have characteristics suitable for this project. Among the alternatives shown, some systems may be proprietary.

The list of prequalified earth retaining systems has been developed from data previously furnished by suppliers or manufacturers of each system. Approval of additional earth retaining systems is contingent on the system meeting the full range of parameters for which prequalification is required. The prequalification requirements can be obtained from the Office of Structure Design, Mail Station 9-2/9I, 1801 30th Street, Sacramento, CA 95816.

#### **WORKING DRAWINGS**

If the Contractor elects to use a proprietary earth retaining system from the list of acceptable alternative systems, the Contractor shall submit complete working drawings for each installation of the system to the Office of Structure Design (OSD) in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. For initial review, 4 sets of drawings shall be submitted. After review between 6 and 12 sets, as requested by the Engineer,

shall be submitted to OSD for final approval and use during construction.

Working drawings shall be 279 mm x 432 mm in size, and each drawing and calculation sheet shall include the State assigned designations for the contract number, bridge number, full name of the structure as shown on the contract plans, and District-County-Route-kilometer Post. The design firm's name, address, and phone number shall be shown on the working drawings. Each sheet shall be numbered in the lower right hand corner and shall contain a blank space in the upper right hand corner for future contract sheet numbers.

The Contractor shall verify the existing ground elevations at the site before preparing the working drawings. The working drawings shall contain all information required for the proper construction of the system at each location including existing ground line at face of wall as verified at the site and any required revisions or additions to drainage systems or other facilities. The working drawings shall include "General Notes" which contain design parameters, material notes, and wall construction procedures. The working drawings and calculations shall be stamped and signed by an engineer who is registered as a Civil Engineer in the State of California. The Contractor shall allow the Engineer 4 weeks to review the drawings after a complete set has been received.

Unless otherwise specified, at the completion of each structure for which working drawings were submitted, and if the work detailed in these working drawings is permanent, the Contractor shall submit to the Engineer one set of corrected as-built prints 279 mm x 432 mm in size and on 75-g/m<sup>2</sup> (minimum) bond paper, showing as built conditions. As-built drawings that are common to more than one structure shall be submitted for each structure.

## MATERIALS

### Earthwork

Excavation and backfill shall conform to the details shown on the plans, the provisions in Section 19, "Earthwork," of the Standard Specifications, and these special provisions.

Structure backfill for earth retaining structures with metallic soil reinforcement 1) shall consist of material free from organic material and substantially free of shale or other soft, poor durability particles, 2) shall not contain slag aggregate or recycled materials such as glass, shredded tires, portland cement concrete rubble, asphaltic concrete rubble, or other unsuitable material as determined by the Engineer, and 3) shall conform to the following requirements:

Gradation Requirements		
Sieve Size	Percentage Passing	California Test
159-mm	100	202
75-mm	78 - 100	202
4.75-mm	----	202
600- $\square$ m	0 - 60	202
75- $\square$ m	0 - 25	202

Property Requirements		
Test	Requirement	California Test
Sand Equivalent	12 min.	217
Plasticity Index	10 max.	204
Minimum Resistivity	1500 ohm-cm min.	643
Chlorides	< 500 ppm	422
Sulfates	< 2000 ppm	417
pH	5.5 to 10.0	643

If 12 percent or less passes the No. 75- $\square$ m sieve and 50 percent or less passes the No. 4.75-mm sieve, the Sand Equivalent and Plasticity Index requirements shall not apply.

Permeable material shall be used for the portion of the structure backfill for earth retaining structures with soil reinforcement within the limits shown on the plans. Permeable material shall be Class 1, Type B, conforming to the provisions in Section 68-1.025, "Permeable Material," of the Standard Specifications and the following requirements:

Property Requirements		
Test	Requirement	California Test
Minimum Resistivity	1500 ohm-cm min.	643
Chlorides	< 500 ppm	422
Sulfates	< 2000 ppm	417

pH	5.5 to 10.0	643
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Water used for earthwork or dust control within 150 meters of the earth retaining structures with metallic soil reinforcement shall conform to the provisions for water in Section 90-2.03, "Water," of the Standard Specifications.

### **Concrete**

Concrete used in precast and cast-in-place reinforced concrete members of earth retaining structures shall conform to the details shown on the plans, the provisions in Section 51, "Concrete Structures," of the Standard Specifications, and these special provisions.

The concrete leveling pads for the Mechanically Stabilized Embankment (MSE) system shall conform to the provisions in Section 90-10, "Minor Concrete," of the Standard Specifications.

### **Reinforcement**

Reinforcement shall conform to the provisions in Section 52, "Reinforcement," of the Standard Specifications and these special provisions.

### **Galvanizing**

Soil reinforcement, connecting elements, and other steel components that are in contact with the earth shall be galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing," of the Standard Specifications.

### **Inspection Wire**

If a proprietary alternative system is selected, inspection elements representative of the particular soil reinforcement shall be furnished in the same number and approximate location as shown on the plans for the MSE system.

The threaded end of the inspection wire may be formed before or after galvanizing. The end 100 mm of the wire shall be coated with 2 applications of an approved unthinned commercial quality zinc-rich primer (organic vehicle type). The threaded end of the wire shall be encapsulated with corrosion inhibiting, mastic filled, round vinyl enclosure secured with a nylon tie as shown on the plans. If the threaded end is galvanized after threading, the threads shall be cleaned before painting. There shall be no damage to the unthreaded portion of the galvanized inspection wire.

### **Drainage System**

The drainage system shall conform to the details shown on the plans and these special provisions.

Corrugated steel pipe shall conform to the provisions in Section 66, "Corrugated Metal Pipe," of the Standard Specifications.

Perforated steel pipe underdrains and underdrain outlets and risers shall conform to the provisions in Section 68-1, "Underdrains," of the Standard Specifications.

The class of rock used for rock slope protection at drain pipe outlets shall be No. 3 Backing, and shall conform to the provisions in Section 72-2, "Rock Slope Protection," of the Standard Specifications.

Filter fabric shall conform to the provisions for fabric for underdrains in Section 88-1.03, "Filter Fabric," of the Standard Specifications, and these special provisions.

Adhesive for bonding filter fabric to concrete panels shall be commercial grade.

### **Soil Reinforcement**

Soil reinforcement shall conform to the details shown on the plans and these special provisions.

MW70 and MW130 steel wire shall conform to the requirements in ASTM Designation: A 82. The welded wire mat shall conform to the requirements in ASTM Designation: A 185. MD70 and MD130 deformed steel wire may be substituted for MW70 and MW130 steel wire, respectively. The welded wire mat utilizing deformed steel wire shall conform to the requirements in ASTM Designation: A 496 and ASTM Designation: A 497.

The button on button-headed wires shall conform to the provisions in Section 50-1.05, "Prestressing Steel," of the Standard Specifications.

The coupler at the mat connection shall be a seamless steel sleeve. The coupler shall be applied over the button-headed wires and swaged by means of a hydraulic press. The coupler shall develop the minimum tensile strength of the wire without exceeding a total slip of the wires of 5.0 mm.

Splicing of the welded wire mat along its length shall be by a mechanical coupler, which shall develop the minimum tensile strength of the wire. The mechanical coupler shall be approved by the Engineer.

### **Miscellaneous**

Resin bonded cork for horizontal joints shall conform to the requirements in ASTM Designation: D 1752, Type II with a compressive load of not less than 690 kPa.

Pipe for the pipe pin shall conform to the requirements in ASTM Designation: A 53, Standard weight, except the amount of the zinc coating per square meter of actual surface shall average not less than 610 g and no individual specimen shall be less than 550 g.

## **CONSTRUCTION**

Earth retaining structures shall be constructed to the lines, grades, and details shown on the plans, and shall conform to these special provisions.

### **Earthwork**

Structure backfill material shall be placed and compacted simultaneously with the erection of the facing panels. Placement and compaction shall be accomplished without distortion of the soil reinforcement or displacement of facing panels. Structure backfill at the front of the wall shall be completed prior to backfilling more than 4 m above the bottom of the lowermost face element.

Structure backfill for earth retaining structures with soil reinforcement shall be compacted to a relative compaction of not less than 90 percent, except when the backfill is within 50 meters of a bridge abutment or for a minimum depth of one meter below the grading plane for the width between the outer edges of shoulders, the backfill shall be compacted to a relative compaction of not less than 95 percent.

Sheepsfoot or grid-type rollers shall not be used for compacting material within the limits of the soil reinforcement. Hand-held or hand-guided compacting equipment shall be used to compact structure backfill material within one meter of the facing panels.

At each level of the soil reinforcement the structure backfill shall be constructed to a plane 45 mm above the elevation of the soil reinforcement connection and shall start one meter from the back of the face panel and extend for at least the remaining length of soil reinforcement. This grading shall be complete before placing the next layer of soil reinforcement.

Permeable material and filter fabric shall be placed along with structure backfill as shown on the plans. Compaction of the permeable material for the drainage system outside the limits of the soil reinforcement is not required, and equipment shall not be operated directly on the permeable material or filter fabric. If a sloped layer of permeable material is placed to facilitate the work or to satisfy safety considerations, the vertical limits of permeable material shall remain unchanged, and the thickness of the layer of permeable material shall be measured normal to the slope.

Permeable material shall be placed in layers not exceeding 0.6-m in thickness.

### **Filter Fabric**

Filter fabric shall be placed at the locations and in conformance with the details shown on the plans and these special provisions.

Immediately prior to placing filter fabric, the subgrade to receive the filter fabric shall conform to the compaction and elevation tolerance specified for the material involved and shall be free of loose or extraneous material and sharp objects that may damage the filter fabric during installation.

Filter fabric shall be handled and placed in conformance with the manufacturer's recommendations.

Filter fabric shall be stretched, aligned, and placed in a wrinkle-free manner.

Adjacent borders of filter fabric shall be stitched or overlapped from 300 mm to 450 mm. The preceding roll shall overlap the following roll in the direction the material is being spread or shall be stitched. When filter fabric is joined by stitching it shall be stitched with yarn of a contrasting color. The size and composition of the yarn shall be as recommended by the filter fabric manufacturer. The stitches shall number 2 to 3 per centimeter of seam.

If the filter fabric is damaged during installation, it shall be repaired by placing a piece of filter fabric that is large enough to cover the damaged area and which meets the overlap requirement.

During spreading of the permeable material, a minimum of 150 mm of the material shall be maintained between the filter fabric and the Contractor's equipment. Where structure backfill material is to be placed on filter fabric, a minimum of 450 mm of structure backfill material shall be maintained between the filter fabric and the Contractor's equipment. Equipment or vehicles shall not be operated or driven directly on filter fabric.

### **Concrete**

Concrete for the leveling pads shall be placed at least 24 hours prior to erecting face panels.

Attention is directed to "Architectural Treatment " of these special provisions.

### **Mechanically Stabilized Embankment System**

If the Contractor elects to construct one of the earth retaining structures shown on the plans, the structure shall conform to the lines, grades, and details shown on the plans and these special provisions.

Concrete panel surfaces, which are to receive filter fabric, shall be dry and thoroughly cleaned of dust and deleterious materials.

After placement of an inspection element and placement of backfill to a level at least 0.6-m above the inspection element, the void in the face panel shall be dry packed with portland cement mortar as shown on the plans. Dry pack shall conform to the provisions in Section 51-1.135, "Mortar," of the Standard Specifications, except that the proportion of cement to sand shall be that required to achieve a 28-day mortar compressive strength of 7 MPa to 10 MPa.

### **Proprietary Earth Retaining Systems**

If the Contractor elects to construct one of the acceptable proprietary alternative earth retaining systems, the structure shall be constructed to the lines and grades shown on the plans. Vertical and horizontal alignment shall be checked at every course throughout the erection process. The construction shall include a drainage system where shown on the plans, and shall conform to the details shown on the approved working drawings, approved proprietary system details, and these special provisions.

Alternative earth retaining structures shall be constructed to accommodate the wall mounted lighting, the wall mounted drainpipe, and the panels for future drainage inlets, as shown on the plans.

The top of wall profile of alternative earth retaining systems shall conform to the profile of the mechanically stabilized embankment shown on the plans. The bottom of face panels shall be at or below the elevation shown on the plans. The height and length to be used for any system shall be the minimums for that system that will effectively retain the earth behind the structure for the loading conditions and the contours, profile, or slope lines shown on the plans. The length of soil reinforcement for any system shall be not less than that shown on the plans. In addition, if the plans or special provisions indicate limiting parameters for alternative systems, the system shall conform to those parameters.

The top of face panels, assuming no leveling pad settlement, shall be covered by the coping lip or concrete barrier slab lip at a minimum of 170 mm. The coping height may be increased from 460 mm to 600 mm maximum along the entire length of the wall at the Contractor's expense.

The top level of soil reinforcement shall be placed parallel to the top of the concrete panel at a distance below the top of the wall as shown on the plans. The top level of soil reinforcement shall also be 1) placed a minimum of 75 mm below the bottom of the barrier slab lip or the bottom of the concrete gutter behind coping and 2) placed a minimum of 125 mm below the top edge of the concrete panel.

### **MEASUREMENT AND PAYMENT**

Earth retaining structures will be measured and paid for by the square meter. Regardless of the type of earth retaining structure actually constructed, the square meter area for payment will be based on the length and vertical height of each section of mechanically stabilized embankment shown on the plans which was or would have been constructed. The vertical height of each section will be taken as the difference in elevation on the outer face from the bottom of the lowermost face element to the top of wall profile.

The contract price paid per square meter for earth retaining structure at each location shown on the plans shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the earth retaining structure and inspection elements, including earthwork, leveling pad, coping, bearing pads, and drainage systems, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract price paid per cubic meter for structural concrete, retaining wall shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the barrier slab, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for revisions to the barrier support, drainage system, or other facilities made necessary by the use of an alternative earth retaining system shall be considered as included in the contract price paid per square meter for earth retaining structure, and no separate payment will be made therefor.

### **10-1.30 CONTROLLED LOW STRENGTH MATERIAL**

Controlled low strength material shall consist of a workable mixture of aggregate, cementitious materials, and water and shall conform to the provisions for slurry cement backfill in Section 19-3.062, "Slurry Cement Backfill," of the Standard Specifications and these special provisions.

At the option of the Contractor, controlled low strength material may be used as structure backfill for pipe culverts, except that controlled low strength material shall not be used as structure backfill for aluminum and aluminum-coated culverts nor for culverts having a diameter or span greater than 6.1 m.

When controlled low strength material is used for structure backfill, the width of the excavation shown on the plans may be reduced so that the clear distance between the outside of the pipe and the side of the excavation, on each side of the pipe, is a minimum of 300 mm. This minimum may be reduced to 150 mm when the height of cover is less than or equal to 6.1 m or the pipe diameter or span is less than 1050 mm.

Controlled low strength material in new construction shall not be permanently placed higher than the basement soil. For trenches in existing pavements, permanent placement shall be no higher than the bottom of the existing pavement permeable drainage layer. If a drainage layer does not exist, permanent placement in existing pavements shall be no higher than 25 mm below the bottom of the existing asphalt concrete surfacing or no higher than the top of base below the existing portland cement concrete pavement. The minimum height that controlled low strength material shall be placed, relative to the culvert invert, is 0.5 diameter or 0.5 height for rigid culverts and 0.7 diameter or 0.7 height for flexible culverts.

When controlled low strength material is proposed for use, the Contractor shall submit a mix design and test data to the Engineer for approval prior to excavating the trench for which controlled low strength material is proposed for use. The test data and mix design shall provide for the following:

- A. A 28-day compressive strength between 345 kPa and 690 kPa for pipe culverts having a height of cover of 6.1 m or less and a minimum 28-day compressive strength of 690 kPa for pipe culverts having a height of cover greater than 6.1 m. Compressive strength shall be determined in conformance with the requirements in ASTM Designation: D 4832.
- B. When controlled low strength material is used as structure backfill for pipe culverts, the sections of pipe culvert in contact with the controlled low strength material shall conform to the requirements of Chapter 850 of the Highway Design Manual using the minimum resistivity, pH, chloride content, and sulfate content of the hardened controlled low strength material. Minimum resistivity and pH shall be determined in conformance with the requirements of California Test 643. The chloride content shall be determined in conformance with the requirements of California Test 422 and the sulfate content shall be determined in conformance with the requirements of California Test 417.
- C. Cement shall be any type of portland cement conforming to the requirements in ASTM Designation: C 150; or any type of blended hydraulic cement conforming to the requirements in ASTM Designation: C 595M or the physical requirements in ASTM Designation: C 1157M. Testing of cement will not be required.
- D. Admixtures may be used in conformance with the provisions in Section 90-4, "Admixtures," of the Standard Specifications. Chemical admixtures containing chlorides as Cl in excess of one percent by mass of admixture, as determined in conformance with the requirements of California Test 415, shall not be used. If an air-entraining admixture is used, the maximum air content shall be limited to 20 percent. Mineral admixtures shall be used at the Contractor's option.

Materials for controlled low strength material shall be thoroughly machine-mixed in a pugmill, rotary drum or other approved mixer. Mixing shall continue until the cementitious material and water are thoroughly dispersed throughout the material. Controlled low strength material shall be placed in the work within 3 hours after introduction of the cement to the aggregates.

When controlled low strength material is to be placed within the traveled way or otherwise to be covered by paving or embankment materials, the material shall achieve a maximum indentation diameter of 76 mm prior to covering and opening to public traffic. Penetration resistance shall be measured in conformance with the requirements in ASTM Designation: D 6024.

Controlled low strength material used as structure backfill for pipe culverts will be considered structure backfill for compensation purposes.

#### 10-1.31 ROCK BLANKET

Rock blanket shall be placed as shown on the plans and in conformance with these special provisions.

##### MATERIALS

Rock for the rock blanket shall be clean, smooth rock obtained from a single source.

Rock for the rock blanket shall conform to the following grading:

Screen Size (Millimeters)	Percentage Passing (By Mass)
355	100
254	90-100

200	0-10
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A sample of the rock shall be submitted to the Engineer for approval prior to delivery of the rock to the project site.

The rock blanket shall be secured in place with Class 2 concrete conforming to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications and these special provisions. The aggregate size shall be 19 mm maximum.

#### **SITE PREPARATION**

Prior to beginning rock blanket work, areas to receive the rock blanket shall be cleared in conformance with the provisions in "Roadside Clearing" of these special provisions.

Areas to receive rock blankets shall be cleared of trash and debris. Weeds shall be removed to the ground level. Cleared trash, debris and removed weeds shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

After clearing, the areas shall be excavated to the depth shown on the plans, graded to a smooth uniform surface and compacted to a minimum relative compaction of 90 percent.

After compaction, the areas shall be sterilized with dichlobenil. The sterilant shall be applied at the maximum label rate unless otherwise directed by the Engineer and shall not be applied more than 300 mm beyond the rock blanket limits. Soil sterilant shall conform to the provisions in Section 20-4.026, "Pesticides," of the Standard Specifications, except recommendations from a licensed Pest Control Adviser will not be required.

#### **PLACEMENT**

Rock shall be secured in place with concrete and spaced a maximum of 20 mm apart and imbedded in the concrete and securely set while the concrete is still plastic. Concrete found adhering to the exposed surfaces of the rock shall be removed. Rock found in a loose condition or with a gap greater than 15 mm between the rock and the rock blanket shall be reset at the Contractor's expense by methods determined by the Engineer. Rock blanket shall not be placed to within 1 m of ground cover areas and other plants.

#### **MEASUREMENT AND PAYMENT**

Rock blanket will be measured by the square meter as determined from actual measurements made parallel to the ground slope.

The contract price paid per square meter for rock blanket shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in placing rock blanket, complete in place, including furnishing and applying soil sterilant, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **10-1.32 MOVE-IN/MOVE-OUT (EROSION CONTROL)**

Move-in/move-out (erosion control) shall include moving onto the project when an area is ready to receive erosion control as determined by the Engineer, setting up all required personnel and equipment for the application of erosion control materials and moving out all personnel and equipment when erosion control in that area is completed.

When areas are ready to receive applications of erosion control (Types D), as determined by the Engineer, the Contractor shall begin erosion control work in that area within 5 working days of the Engineer's notification to perform the erosion control work.

Attention is directed to the requirements of erosion control (Types D) elsewhere in these special provisions.

Quantities of move-in/move-out (erosion control) will be determined as units from actual count as determined by the Engineer. For measurement purposes, a move-in followed by a move-out will be considered as one unit.

The contract unit price paid for move-in/move-out (erosion control) shall include full compensation for furnishing all labor, materials (excluding erosion control materials), tools, equipment, and incidentals and for doing all the work involved in moving in and removing from the project all personnel and equipment necessary for application of erosion control (Types D), as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

No adjustment of compensation will be made for any increase or decrease in the quantities of move-in/move-out (erosion control) required, regardless of the reason for the increase or decrease. The provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications shall not apply to the item of move-in/move-out (erosion control).

#### **10-1.33 EROSION CONTROL (TYPE D)**



Erosion control (Type D) shall conform to the provisions in Section 20-3, "Erosion Control," of the Standard Specifications and these special provisions and shall consist of applying erosion-control materials to embankment and excavation slopes and other areas disturbed by construction activities.

Erosion control (Type D) shall be applied when an area is ready to receive erosion control as determined by the Engineer and in conformance with the provisions in "Move-in/Move-out (Erosion Control)" of these special provisions.

Prior to installing erosion control materials, soil surface preparation shall conform to the provisions in Section 19-2.05, "Slopes," of the Standard Specifications, except that rills and gullies exceeding 50 mm in depth or width shall be leveled. Vegetative growth, temporary erosion control materials, and other debris shall be removed from areas to receive erosion control.

## **MATERIALS**

Materials shall conform to the provisions in Section 20-2, "Materials," of the Standard Specifications and these special provisions.

### **Seed**

Seed shall conform to the provisions in Section 20-2.10, "Seed," of the Standard Specifications. Individual seed species shall be measured and mixed in the presence of the Engineer.

Seed shall be delivered to the project site in unopened separate containers with the seed tag attached. Containers without a seed tag attached will not be accepted.

A sample of approximately 30 g of seed will be taken from each seed container by the Engineer.

### **Legume Seed**

Legume seed shall be pellet-inoculated or industrial-inoculated and shall conform to the following:

- A. Inoculated seed shall be inoculated in conformance with the provisions in Section 20-2.10, "Seed," of the Standard Specifications.
- B. Inoculated seed shall have a calcium carbonate coating.
- C. Industrial-inoculated seed shall be inoculated with Rhizobia and coated using an industrial process by a manufacturer whose principal business is seed coating and seed inoculation.
- D. Industrial-inoculated seed shall be sown within 180 calendar days after inoculation.
- E. Legume seed shall consist of the following:

LEGUME SEED			
Botanical Name (Common Name)		Percent Germination (Minimum)	Kilograms Pure Live Seed Per Hectare (Slope Measurement)
Trifolium repens (Rose clover)		50	10

### **Non-Legume Seed**

Non-legume seed shall consist of the following:

NON-LEGUME SEED			
Botanical Name (Common Name)		Percent Germination (Minimum)	Kilograms Pure Live Seed Per Hectare (Slope Measurement)
Vulpia myuros (Zorro fescue)		45	15

### **Commercial Fertilizer**

Commercial fertilizer shall conform to the provisions in Section 20-2.02, "Commercial Fertilizer," of the Standard Specifications and shall have a guaranteed chemical analysis of 15 percent nitrogen, 15 percent phosphoric acid and 15 percent water soluble potash.

### **Straw**

Straw shall conform to the provisions in Section 20-2.06, "Straw," of the Standard Specifications and these special provisions.

Wheat and barley straw shall be derived from irrigated crops.

Prior to delivery of wheat or barley straw to the project site, the Contractor shall provide the name, address and telephone number of the grower.

### **Compost**

Compost shall be derived from green material consisting of chipped, shredded or ground vegetation or clean processed recycled wood products or a Class A, exceptional quality biosolids composts, as required by the United States Environmental Protection Agency (EPA), 40 CFR, Part 503c regulations or a combination of green material and biosolids compost. The compost shall be processed or completed to reduce weed seeds, pathogens and deleterious material, and shall not contain paint, petroleum products, herbicides, fungicides or other chemical residues that would be harmful to plant or animal life. Other deleterious material, plastic, glass, metal or rocks shall not exceed 0.1 percent by weight or volume. A minimum internal temperature of 57°C shall be maintained for at least 15 continuous days during the composting process. The compost shall be thoroughly turned a minimum of 5 times during the composting process and shall go through a minimum 90-day curing period after the 15-day thermophilic compost process has been completed. Compost shall be screened through a maximum 9.5-mm screen. The moisture content of the compost shall not exceed 35 percent. Compost products with a higher moisture content may be used provided the weight of the compost is increased to equal the compost with a moisture content of 35 percent. Moist samples of compost on an as received basis shall be dried in an oven at a temperature between 105°C and 115°C until a constant dry weight of the sample is achieved. The percentage of moisture will be determined by dividing the dry weight of the sample by the moist weight of the sample and then multiplying by 100. Compost will be tested for maturity and stability with a Solvita test kit. The compost shall measure a minimum of 6 on the maturity and stability scale.

### **Stabilizing Emulsion**

Stabilizing emulsion shall conform to the provisions in Section 20-2.11, "Stabilizing Emulsion," of the Standard Specifications and these special provisions.

Stabilizing emulsion shall be in a dry powder form, may be reemulsifiable, and shall be a processed organic adhesive used as a soil tackifier.

## **APPLICATION**

Erosion control materials shall be applied in separate applications in the following sequence:

- A. The following mixture in the proportions indicated shall be applied with hydro-seeding equipment within 60 minutes after the seed has been added to the mixture:

Material	Kilograms Per Hectare (Slope Measurement)
Legume Seed	15
Non-Legume Seed	10
Fiber	700
Compost	2000
Commercial Fertilizer	500

- B. The Contractor may dry apply compost at the total of the rates specified in the preceding table and the following table instead of including it as part of the hydro-seeding operations. In areas where the compost is dry applied, all compost for that area shall be applied before the next operation.
- C. Straw shall be applied at the rate of 4 tonnes per hectare based on slope measurements. Incorporation of straw will not be required. Straw shall be distributed evenly without clumping or piling.
- D. The following mixture in the proportions indicated shall be applied with hydro-seeding equipment:

Material	Kilograms Per Hectare (Slope Measurement)
Fiber	700
Compost	2000
Commercial Fertilizer	500

The ratio of total water to total stabilizing emulsion in the mixture shall be as recommended by the manufacturer.

Once straw work is started in an area, stabilizing emulsion applications shall be completed in that area on the same working day.

The proportions of erosion control materials may be changed by the Engineer to meet field conditions.

### **MEASUREMENT AND PAYMENT**

Compost (erosion control) will be measured by the kilogram or tonne, whichever unit is designated in the Engineer's Estimate. The weight will be as determined by the Engineer from marked mass and sack count or from scale weighings.

The contract price paid per kilogram or tonne for compost (erosion control) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying compost for erosion control, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **10-1.34 IRRIGATION CROSSOVERS**

Irrigation crossovers shall conform to the provisions in Section 20-5, "Irrigation Systems," of the Standard Specifications and these special provisions.

Conduits shall be placed in open trenches in conformance with the provisions in Section 20-5.03B, "Conduit for Irrigation Crossovers," of the Standard Specifications.

Conduits shall be corrugated high density polyethylene (CHDPE) pipe. Corrugated high density polyethylene pipe shall conform to the requirements in ASTM Designation: F 405 or F 667, or AASHTO Designation: M 252 or M 294 and shall be Type S. Couplings and fittings shall be as recommended by the pipe manufacturer.

Water line crossovers shall conform to the provisions in Section 20-5.03C, "Water Line Crossovers," of the Standard Specifications.

Installation of pull boxes shall conform to the provisions in Section 20-5.027I, "Conductors, Electrical Conduit and Pull Boxes," of the Standard Specifications. When no conductors are installed in electrical conduits, pull boxes for irrigation crossovers shall be installed on a foundation of compacted soil.

### **10-1.35 FINISHING ROADWAY**

Finishing roadway shall conform to the provisions in Section 22, "Finishing Roadway," of the Standard Specifications.

### **10-1.36 AGGREGATE BASE**

Aggregate base shall be Class 2 and shall conform to the provisions in Section 26, "Aggregate Bases," of the Standard Specifications and these special provisions.

The restriction that the amount of reclaimed material included in Class 2 aggregate base not exceed 50 percent of the total volume of the aggregate used shall not apply. Aggregate for Class 2 aggregate base may include reclaimed glass. Aggregate base incorporating reclaimed glass shall not be placed at locations where surfacing will not be placed over the aggregate base.

### **10-1.37 ASPHALT CONCRETE**

Asphalt concrete shall be Type A and open-graded and shall conform to the provisions in Section 39, "Asphalt Concrete," of the Standard Specifications and these special provisions.

Open graded asphalt concrete may be placed when the atmospheric temperature is below 20°C, but above 13°C, provided the following requirements are met:

- A. The aggregate grading shall be 12.5-mm maximum.
- B. Open graded asphalt concrete shall not be placed in a windrow or stockpile. Open graded asphalt concrete shall be transferred directly from the hauling vehicle to the asphalt paver hopper.
- C. Open graded asphalt concrete shall be not less than 30 mm in compacted thickness.
- D. Immediately prior to adding the asphalt binder to the open graded asphalt concrete mixture, the temperature of the aggregate shall be not more than 135°C. Open graded asphalt concrete shall be spread at a temperature of not less than 105°C measured in the hopper in the asphalt paver.
- E. The compaction operation shall be such that the maximum distance between the asphalt paver and the initial breakdown rolling shall be no greater than 15 m.
- F. During the placement of open graded asphalt concrete, the speed of the asphalt paver shall not exceed 10 m per

minute.

- G. The Contractor shall cover loads of open graded asphalt concrete with tarpaulins. The tarpaulins shall completely cover exposed open graded asphalt concrete in the hauling vehicle until the open graded asphalt concrete has been completely transferred into the asphalt paver hopper.

The amount of asphalt binder used in asphalt concrete placed in dikes, gutters, gutter flares, overside drains and aprons at the ends of drainage structures shall be increased one percent by mass of the aggregate over the amount of asphalt binder determined for use in asphalt concrete placed on the traveled way.

The asphalt content of the asphalt mixture will be determined in conformance with the requirements in California Test 379, or in conformance with the requirements in California Test 382.

Paint binder (tack coat) shall be applied to existing surfaces to be surfaced and between layers of asphalt concrete, except when eliminated by the Engineer.

Paint binder (tack coat) shall be paving asphalt conforming to the provisions in Section 39-4.02, "Prime Coat and Paint Binder (Tack Coat)," and Section 92, "Asphalts," of the Standard Specifications. The grade of paving asphalt to be used as paint binder will be determined by the Engineer.

Paint binder (tack coat) shall be applied in the liter per square meter range limits specified for the surfaces to receive asphalt concrete in the tables below. The exact application rate within the range will be determined by the Engineer.

Application Rates for Paint Binder (Tack Coat) for Asphalt Concrete (except Open Graded)	
Type of surface to receive paint binder (tack coat)	Paving Asphalt L/m <sup>2</sup>
Dense, compact surfaces and between layers	0.05 – 0.10
Open textured, or dry, aged surfaces	0.10 – 0.25

Application Rates for Paint Binder (Tack Coat) for Open Graded Asphalt Concrete	
Type of surface to receive paint binder (tack coat)	Paving Asphalt L/m <sup>2</sup>
Dense, compact surfaces and between layers	0.05 – 0.15
Open textured, or dry, aged surfaces	0.15 – 0.30

Asphalt concrete placed in layers of 45 mm or less in compacted thickness or widths of less than 1.5 m shall be spread and compacted with the equipment and by the methods conforming to the provisions in Section 39, "Asphalt Concrete," of the Standard Specifications. Other asphalt concrete shall be compacted and finished in conformance with the provisions in Section 39 and the following:

- A. The provisions in Section 39-5.02, "Compacting Equipment," of the Standard Specifications shall not apply.
- B. The Contractor shall furnish a sufficient number of rollers to obtain the compaction specified in these special provisions and the surface finish required by the Standard Specifications and these special provisions.
- C. Rollers shall be equipped with pads and water systems that prevent sticking of asphalt mixtures to the pneumatic-tired or steel-tired wheels. A parting agent that will not damage the asphalt mixture may be used.
- D. The second paragraph in Section 39-6.01, "General Requirements," of the Standard Specifications shall not apply.
- E. Asphalt concrete and asphalt concrete base shall be compacted by any means to obtain the specified relative compaction before the temperature of the mixture drops below 65°C. Additional rolling to achieve the specified relative compaction will not be permitted after the temperature of the mixture drops below 65°C or once the pavement is opened to public traffic. When vibratory rollers are used as finish rollers the vibratory unit shall be turned off.
- F. The fifth and seventh through tenth paragraphs of Section 39-6.03, "Compacting," of the Standard Specifications shall not apply.
- G. Asphalt concrete and asphalt concrete base shall be compacted to a relative compaction of not less than 96.0 percent and shall be finished to the lines, grades, and cross section shown on the plans. In-place density of asphalt concrete and asphalt concrete base will be determined prior to opening the pavement to public traffic.
- H. Relative compaction will be determined by California Test 375.
- I. If the test results for a quantity of asphalt concrete or asphalt concrete base indicate that the relative compaction is below 96.0 percent, the Contractor will be notified. Asphalt concrete or asphalt concrete base spreading operations

shall not continue until the Contractor has notified the Engineer of the adjustment that will be made in order to meet the specified relative compaction.

- J. If the test results for a quantity of asphalt concrete or asphalt concrete base indicate that the relative compaction is less than 96.0 percent, the asphalt concrete or asphalt concrete base represented by that quantity shall be removed, except as otherwise provided in these special provisions. If requested by the Contractor and approved by the Engineer, asphalt concrete or asphalt concrete base with a relative compaction of 93.0 percent or greater may remain in place and the Contractor shall pay to the State the amount of reduced compensation for the quantity with relative compaction less than 96.0 percent and greater than or equal to 93.0 percent. The Department will deduct the amount of reduced compensation from moneys due, or that may become due, the Contractor under the contract. The amount of reduced compensation the Contractor shall pay to the State will be calculated using the total tonnes in the quantity with relative compaction less than 96.0 percent and greater than or equal to 93.0 percent multiplied by the contract price per tonne for asphalt concrete or asphalt concrete base involved multiplied by the following compensation factors:

Relative Compaction (Percent)	Reduced Compensation Factor	Relative Compaction (Percent)	Reduced Compensation Factor
96.0	0.000	94.4	0.062
95.9	0.002	94.3	0.068
95.8	0.004	94.2	0.075
95.7	0.006	94.1	0.082
95.6	0.009	94.0	0.090
95.5	0.012	93.9	0.098
95.4	0.015	93.8	0.108
95.3	0.018	93.7	0.118
95.2	0.022	93.6	0.129
95.1	0.026	93.5	0.142
95.0	0.030	93.4	0.157
94.9	0.034	93.3	0.175
94.8	0.039	93.2	0.196
94.7	0.044	93.1	0.225
94.6	0.050	93.0	0.300
94.5	0.056		

Immediately prior to placing binder, pavement reinforcing fabric, and asphalt concrete surfacing, the pavement shall be cleaned of loose and extraneous materials such as, but not limited to, vegetation, sand, dirt, gravel and water.

Before placing the pavement reinforcing fabric, a binder of paving asphalt Grade AR-8000 shall be applied uniformly to the surface to receive the pavement reinforcing fabric at a rate of not less than 1.15 L per square meter of surface covered. When pavement reinforcing fabric is placed in areas of conform tapers, the binder shall be spread at the approximate rate of 1.4 L per square meter of surface covered. The exact rate of application of asphalt binder will be determined by the Engineer.

Pavement reinforcing fabric shall not be placed in areas of conform tapers when the thickness of the overlying asphalt concrete will be less than 40 mm.

Asphalt concrete surfacing shall be placed over the pavement reinforcing fabric in the same work shift that the fabric is placed.

Pavement reinforcing fabric shall not be exposed to public traffic, Contractor's equipment or elements that will damage the fabric prior to placement of asphalt concrete surfacing.

Asphaltic emulsion shall not be substituted for paving asphalt binder for pavement reinforcing fabric.

Full compensation for cleaning pavement immediately in advance of placing binder, pavement reinforcing fabric, and asphalt concrete surfacing shall be considered as included in the contract price paid per square meter for pavement reinforcing fabric and no separate payment will be made therefor.

The miscellaneous areas to be paid for at the contract price per square meter for place asphalt concrete (miscellaneous area), in addition to the prices paid for the materials involved, shall be limited to the areas listed on the plans.

In median areas adjacent to slotted median drains, each layer of asphalt concrete shall not exceed 50 mm, maximum compacted thickness.

Aggregate for asphalt concrete dikes shall be in conformance with the provisions for 9.5-mm Maximum grading in Section 39-2.02, "Aggregate," of the Standard Specifications.

If the Contractor selects the batch mixing method, asphalt concrete shall be produced by the automatic batch mixing method in conformance with the provisions in Section 39-3.03A(2), "Automatic Proportioning," of the Standard Specifications.

If the finished surface of the asphalt concrete on Route 80 traffic lanes does not meet the specified surface tolerances, the surfacing shall be brought within tolerance by either (1) abrasive grinding (with fog seal coat on the areas which have been ground), (2) removal and replacement or (3) placing an overlay of asphalt concrete. The method will be selected by the Engineer. The corrective work shall be at the Contractor's expense.

If abrasive grinding is used to bring the finished surface to the specified surface tolerances, additional grinding shall be performed, as necessary, to extend the area ground in each lateral direction so that the lateral limits of grinding are at a constant offset from, and parallel to, the nearest lane line or pavement edge, and in each longitudinal direction so that the grinding begins and ends at lines normal to the pavement centerline, within any ground area. Ground areas shall be neat rectangular areas of uniform surface appearance. Abrasive grinding shall conform to the provisions in the first paragraph and the last 4 paragraphs in Section 42-2.02, "Construction," of the Standard Specifications.

In addition to the provisions in Section 39-5.01, "Spreading Equipment," of the Standard Specifications, asphalt paving equipment shall be equipped with automatic screed controls and a sensing device or devices.

When placing asphalt concrete to the lines and grades established by the Engineer, the automatic controls shall control the longitudinal grade and transverse slope of the screed. Grade and slope references shall be furnished, installed, and maintained by the Contractor. Should the Contractor elect to use a ski device, the minimum length of the ski device shall be 9 m. The ski device shall be a rigid one piece unit and the entire length shall be utilized in activating the sensor.

When placing the initial mat of asphalt concrete on existing pavement, the end of the screed nearest the centerline shall be controlled by a sensor activated by a ski device not less than 9 m long. The end of the screed farthest from centerline shall be controlled manually.

When paving contiguously with previously placed mats, the end of the screed adjacent to the previously placed mat shall be controlled by a sensor that responds to the grade of the previously placed mat and will reproduce the grade in the new mat within a 3-mm tolerance. The end of the screed farthest from the previously placed mat shall be controlled in the same way it was controlled when placing the initial mat.

Should the methods and equipment furnished by the Contractor fail to produce a layer of asphalt concrete conforming to the provisions, including straightedge tolerance, of Section 39-6.03, "Compacting," of the Standard Specifications, the paving operations shall be discontinued and the Contractor shall modify the equipment or methods, or furnish substitute equipment.

Should the automatic screed controls fail to operate properly during a day's work, the Contractor may manually control the spreading equipment for the remainder of that day. However, the equipment shall be corrected or replaced with alternative automatically controlled equipment conforming to the provisions in this section before starting another day's work.

The area to which paint binder has been applied shall be closed to public traffic. Care shall be taken to avoid tracking binder material onto existing pavement surfaces beyond the limits of construction.

The Contractor shall schedule paving operations so that each layer of asphalt concrete is placed on contiguous lanes of the traveled way during each work shift. At the end of each work shift, the distance between the ends of the layers of asphalt concrete on adjacent lanes shall not be greater than 3 m or less than 1.5 m. Additional asphalt concrete shall be placed along the transverse edge at the end of each lane and along the exposed longitudinal edges between adjacent lanes, hand raked, and compacted to form temporary conforms. Kraft paper, or other approved bond breaker, may be placed under the conform tapers to facilitate the removal of the taper when paving operations resume.

Where the existing pavement is to be widened by constructing a new structural section adjacent to the existing pavement, the new structural section, on both sides of the existing pavement, shall be completed to match the elevation of the edge of the existing pavement for the entire length of the project prior to spreading and compacting asphalt concrete over the adjacent existing pavement.

Additional asphalt concrete surfacing material shall be placed along the edge of the surfacing at road connections and private drives, hand raked, if necessary, and compacted to form smooth tapered conforms. Full compensation for furnishing all labor and tools and for doing all the work necessary to hand rake these conforms shall be considered as included in the contract prices paid per tonne for the various items of asphalt concrete surfacing involved and no additional compensation will be allowed therefor.

#### **10-1.38 TEMPORARY ASPHALT CONCRETE TAPERS**

This work shall consist of constructing temporary asphalt concrete tapers in accordance with the details shown on the plans and as specified in these special provisions.

Where transverse joints are planed in the pavement at conform lines or where asphalt concrete has not been placed to match the elevation of the existing pavement, the Contractor shall construct asphalt concrete tapers prior to opening the

traveled way to public traffic.

Asphalt concrete for temporary tapers shall be placed to the level of the existing pavement and tapered on a slope of 1:200 (Vertical: Horizontal) or flatter to the level of the planed area or adjacent pavement surface.

Asphalt concrete shall be commercial quality, hot or cold mix, produced at an established commercial mixing plant.

Aggregate shall conform to the 9.5 mm or 12.5 mm maximum grading specified in Section 39-2.02, "Aggregate," of the Standard Specifications, or as approved by the Engineer.

Asphalt concrete tapers shall be spread with paving equipment as specified in Section 39-5.01, "Spreading Equipment," of the Standard Specifications.

Compaction shall be performed with a steel-tired tandem roller weighing not less than 7.2 tonnes. Compaction shall consist of 3 complete coverage's.

Rolling shall be performed so that cracking, shoving, or displacement shall not occur.

The completed surface shall be of uniform smoothness and texture, compacted firmly and free from depressions, humps or irregularities. When a straightedge 3.6m +/- 0.06m long is laid on the finished surface parallel with the centerline, the surface shall not vary more than 9 mm from the lower edge of the straightedge.

The above requirements shall not apply to temporary transverse cold joints to remain in place less than 72 hours, constructed during ongoing paving operations or when the approach speed of public traffic is 45 miles per hour or less.

Temporary asphalt concrete tapers shall be completely removed, including the removal of all loose material from the underlying surface, before placing the permanent surfacing. The removed material shall be disposed of outside the highway right of way in accordance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Temporary asphalt concrete tapers will be measured and paid for by the tonne as asphalt concrete (Type A).

Full compensation for constructing, maintaining, and removing temporary asphalt concrete tapers shall be considered as included in the contract price paid per tonne for asphalt concrete (Type A) and no additional compensation will be allowed therefor.

## **10-1.39 PILING**

### **GENERAL**

Piling shall conform to the provisions in Section 49, "Piling," of the Standard Specifications, and these special provisions.

Unless otherwise specified, welding of any work performed in conformance with the provisions in Section 49, "Piling," of the Standard Specifications, shall be in conformance with the requirements in AWS D1.1.

Foundation recommendations are included in the "Information Handout" available to the Contractor as provided for in Section 2-1.03, "Examination of Plans, Specifications, Contract, and Site of Work," of the Standard Specifications.

Rock cores are available for viewing at the Transportation Laboratory.

Attention is directed to "Welding" of these special provisions.

Difficult pile installation is anticipated due to the presence of locally soft bay mud overlying dense soils.

Alternative "X" type piles shall have a dimension, T, not less than 355 mm at Abutments 1 and 6.

### **Jetting and Drilling**

Jetting or drilling to obtain the specified penetration in conformance with the provisions in Section 49-1.05, "Driving Equipment," of the Standard Specifications shall only be used for driven type piles at the locations and to the bottom of jet or hole elevations listed in the following table. Materials resulting from jetting or drilling holes shall be disposed of in conformance with the provisions in Section 19-2.06, "Surplus Material," of the Standard Specifications.

Bridge Name or Number	Abutment Number	Bent Number	Elevation of Bottom of Jet or Hole
Douglas – Sunrise Connector OC	1 and 6	N/A	46

### **Predrilled Holes**

Piles shall be driven in oversized drilled holes in conformance with the provisions in Section 49-1.06, "Predrilled Holes," of the Standard Specifications at the locations and to the corresponding bottom of hole elevations listed in the following table:

Bridge Name or Number	Abutment Number	Bent Number	Elevation of Bottom of Hole
Douglas – Sunrise Connector OC	1	N/A	50

In addition, piles which are designated on the plans to be predrilled due to close proximity to an obstruction shall be treated as piles driven in predrilled holes through embankments in conformance with the provisions in Section 49-1.06, "Predrilled Holes," and Section 49-6.02, "Payment," of the Standard Specifications. These locations and corresponding bottom of hole elevations are listed in the following table:

#### **MEASUREMENT AND PAYMENT (PILING)**

Measurement and payment for the various types and classes of piles shall conform to the provisions in Sections 49-6.01, "Measurement," and 49-6.02, "Payment," of the Standard Specifications and these special provisions.

#### **10-1.40 PRESTRESSING CONCRETE**

Prestressing concrete shall conform to the provisions in Section 50, "Prestressing Concrete," of the Standard Specifications and these special provisions.

The details shown on the plans for cast-in-place prestressed box girder bridges are based on a bonded full length draped tendon prestressing system. For these bridges the Contractor may, in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications, propose an alternative prestressing system utilizing bonded partial length tendons provided the proposed system and associated details meet the following requirements:

- A. The proposed system and details shall provide moment and shear resistances at least equal to those used for the design of the structure shown on the plans.
- B. The concrete strength shall not be less than that shown on the plans.
- C. Not less than 50 percent of the total prestressing force at any section shall be provided by full length draped tendons.
- D. Anchorage blocks for partial length tendons shall be located so that the blocks will not interfere with the placement of the utility facilities shown on the plans or of any future utilities to be placed through openings shown on the plans.
- E. Temporary prestressing tendons, if used, shall be detensioned, and the temporary ducts shall be filled with grout before completion of the work. Temporary tendons shall be either removed or fully encased in grout before completion of the work.
- F. All details of the proposed system, including supporting checked calculations, shall be included in the drawings submitted in conformance with the provisions in Section 50-1.02, "Drawings," of the Standard Specifications.

Moments and shears for loads used in the design shown on the plans will be made available to the Contractor upon written request to the Engineer.

#### **10-1.41 CONCRETE STRUCTURES**

Portland cement concrete structures shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

##### **GENERAL**

Shotcrete shall not be used as an alternative construction method for reinforced concrete members unless otherwise specified.

Exposed concrete surfaces of the tunnel and portal shall receive a Class 1 surface finish conforming to Section 51-1.18, "Surface Finish," of the Standard Specifications, except for the finishing of the top surface of the tunnel bottom slab and the top surface of the exposed seal slab within the portals that shall conform with Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications.

All corners of concrete surfaces that are to be in contact with membrane waterproofing shall contain not less than 25 mm x 25 mm triangular fillets or chamfers.

Materials for access opening covers in soffits of new cast-in-place concrete box girder bridges shall conform to the provisions for materials in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications.

##### **AGGREGATE GRADINGS**

The aggregate grading of concrete for the columns of bents 2, 3, 4, and 5 of Bridge No. 19-0018 shall be the 12.5-mm maximum combined aggregate grading and shall conform to the requirements in Section 90-3, "Aggregate Gradings," of the Standard Specifications.

##### **FALSEWORK**



Falsework shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

In addition to the provisions in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications, the time to be provided for the Engineer's review of the working drawings for specific structures, or portions thereof, shall be as follows:

Structure or Portion of Structure	Total Review Time - Weeks
Douglas – Sunrise Connector OC	5

Temporary crash cushion modules, as shown on the plans and conforming to the provisions in "Temporary Crash Cushion Module" of these special provisions, shall be installed at the approach end of temporary railings which are located less than 4.6 m from the edge of a traffic lane. For 2-way traffic openings, temporary crash cushion modules shall be installed at the departing end of temporary railings which are located less than 1.8 m from the edge of a traffic lane.

### **Welding and Nondestructive Testing**

Welding of steel members, except for previously welded splices and except for when fillet welds are used where load demands are less than or equal to 175 N/mm for each 3 mm of fillet weld, shall conform to AWS D1.1 or other recognized welding standard. The welding standard to be utilized shall be specified by the Contractor on the working drawings. Previously welded splices for falsework members are defined as splices made prior to the member being shipped to the project site.

Splices made by field welding of steel beams at the project site shall undergo nondestructive testing (NDT). At the option of the Contractor, either ultrasonic testing (UT) or radiographic testing (RT) shall be used as the method of NDT for each field weld and any repair made to a previously welded splice in a steel beam. Testing shall be performed at locations selected by the Contractor. The length of a splice weld where NDT is to be performed, shall be a cumulative weld length equal to 25 percent of the original splice weld length. The cover pass shall be ground smooth at the locations to be tested. The acceptance criteria shall conform to the requirements of AWS D1.1, Section 6, for cyclically loaded nontubular connections subject to tensile stress. If repairs are required in a portion of the weld, additional NDT shall be performed on the repaired sections. The NDT method chosen shall be used for an entire splice evaluation including any required repairs.

For all field welded splices, the Contractor shall furnish to the Engineer a letter of certification which certifies that all welding and NDT, including visual inspection, are in conformance with the specifications and the welding standard shown on the approved working drawings. This letter of certification shall be signed by an engineer who is registered as a Civil Engineer in the State of California and shall be provided prior to placing any concrete for which the falsework is being erected to support.

For previously welded splices, the Contractor shall determine and perform all necessary testing and inspection required to certify the ability of the falsework members to sustain the stresses required by the falsework design. This welding certification shall be in writing, shall be signed by an engineer who is registered as a Civil Engineer in the State of California, and shall be provided prior to placing any concrete for which the falsework is being erected to support.

The Contractor's engineer who signs the falsework drawings shall also certify in writing that the falsework is constructed in conformance with the approved drawings and the contract specifications prior to placing concrete. This certification shall include performing any testing necessary to verify the ability of the falsework members to sustain the stresses required by the falsework design. The engineer who signs the drawings may designate a representative to perform this certification. Where falsework contains openings for railroads, vehicular traffic, or pedestrians, the designated representative shall be qualified to perform this work, shall have at least three years of combined experience in falsework design or supervising falsework construction, and shall be registered as a Civil Engineer in the State of California. For other falsework, the designated representative shall be qualified to perform this work and shall have at least three years of combined experience in falsework design or supervising falsework construction. The Contractor shall certify the experience of the designated representative in writing and provide supporting documentation demonstrating the required experience if requested by the Engineer.

### **STAIR NOSING**

Abrasive stair nosing for concrete stairs shall be aluminum (Alloy 6061T6) angles 64 mm by 64 mm with a width equal to 200 mm less than the width of concrete stair. The walking surfaces of the nosing shall have integrally cast abrasive grit to provide anti-slip protection. Front edge of nosing shall be rounded. Nosing shall include concrete anchors. Nosing shall be American Abrasive Metals Company Curb Bar CB2, Barry Craft CB25A, or equal. Full compensation for furnishing and installing abrasive stair nosing shall be considered as included in the contract price paid per cubic meter for structural concrete, tunnel and no additional compensation will be allowed therefor.

### **10-1.42 ARCHITECTURAL SURFACE (TEXTURED CONCRETE)**

Architectural texture for concrete surfaces shall conform to the details shown on the plans and the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

Dry stack stone texture is required at concrete surfaces of retaining walls, portal walls and building walls as shown on the plans. Dry stack stone texture shall be an architectural treatment created by formed reliefs simulating the appearance of a dry stack stone wall.

#### TEST PANEL

Attention is directed to "Prepare and Paint Architectural Surface (Textured Concrete)" of these special provisions.

The test panel approved by the Engineer shall be used as the standard of comparison in determining acceptability of architectural texture for concrete surfaces.

#### FORM LINERS

Form liners shall be used for textured concrete surfaces and shall be installed in conformance with the manufacturer's recommendations, unless other methods of forming textured concrete surfaces are approved by the Engineer. Form liners shall be manufactured from an elastomeric material, a plasticized polyvinyl chloride or a semi-elastomeric polyurethane material by a manufacturer of commercially available concrete form liners. No substitution of other types of formliner material will be allowed. Form liners shall leave crisp, sharp definition of the architectural surface. Recurring textural configurations exhibited by repeating, recognizable shadow patterns shall be prevented by proper casting of form liner patterns. Textured concrete surfaces with such recurring textural configurations shall be reworked to remove such patterns as approved by the Engineer or the concrete shall be replaced. The dry stack stone pattern shall be arranged such that there are no partial stones along the interior joints of the form liner panels.

Form liners shall have the following properties:

Description	ASTM Designation:	Range
Elastomeric material		
Shore A hardness	D 2240	40 to 65
Tensile strength (MPa)	D 412	0.9 to 6.2
Semi-elastomeric polyurethane		
Shore D hardness	D 2240	55 to 65
Tensile strength (MPa)	D 2370	18 minimum
Plasticized Polyvinyl Chloride		
Shore A hardness	D 2240	20 to 30
Tensile strength (MPa)	D 412	1.0 Minimum

Cuts and tears in form liners shall be sealed and repaired in conformance with the manufacturer's recommendations. Form liners that are delaminated from the form shall not be used. Form liners with deformations to the manufactured surface caused by improper storage practices or any other reason shall not be used.

Form liners shall extend the full length of texturing with transverse joints at 2.5 m minimum spacing. Small pieces of form liners shall not be used. Grooves shall be aligned straight and true. Grooves shall match at joints between form liners. Joints in the direction of grooves in grooved patterns shall be located only in the depressed portion of the textured concrete. Adjoining liners shall be butted together without distortion, open cracks or offsets at the joints. Joints between liners shall be cleaned before each use to remove any mortar in the joint.

Adhesives shall be compatible with the form liner material and with concrete. Adhesives shall be approved by the liner manufacturer. Adhesives shall not cause swelling of the liner material.

## **RELEASING FORM LINERS**

Products and application procedures for form release agents shall be approved by the form liner manufacturer. Release agents shall not cause swelling of the liner material or delamination from the forms. Release agents shall not stain the concrete or react with the liner material. The release agent shall coat the liner with a thin film. Following application of form release agent, the liner surfaces shall be cleaned of excess amounts of agent using compressed air. Buildup of form release agent caused by the reuse of a liner shall be removed at least every 5 uses.

Form liners shall release without leaving particles or pieces of liner material on the concrete and without pulling or breaking concrete from the textured surface. The concrete surfaces exposed by removing forms shall be protected from damage.

## **CURING**

Concrete surfaces with architectural texture shall be cured only by the forms-in-place or water methods. Seals and curing compounds shall not be used.

## **SURFACE FINISH**

Attention is directed to "Prepare and Paint Architectural Surface (Textured Concrete)" of these special provisions.

## **ANTI-GRAFFITI PROTECTIVE COATING**

Anti-graffiti protective coating for use on dry stack stone architectural treatment shall conform to Section 7, "Legal Relations and Responsibilities," of the Standard Specifications and these special provisions.

All surfaces to be treated shall have been cured a minimum of 28 days or painted a minimum of 21 days prior to treatment, and shall be clean and dry prior to applying the protective coating. The protective coating shall be sprayed in accordance with the manufacturer's instructions.

The anti-graffiti protective coating shall be a clear, non-flammable, vegetable based polymer, permanent type, easily washed with water and a biodegradable detergent, used to prevent graffiti from penetrating the surface of concrete materials.

The Contractor shall submit for approval by the Engineer, not less than one week prior to initial application of the anti-graffiti protective coating, a sample of the coating. Anti-graffiti protective coating shall be applied in a minimum of 3 even coats on all surfaces to be treated. Each coat must be thoroughly dried before applying next coat.

## **MEASUREMENT AND PAYMENT**

Architectural texture for retaining walls, tunnel end parapets and portal walls will be measured and paid for by the square meter. The area for payment shall be calculated from the limits of the dry stack stone texture projected onto a vertical plane along the wall layout line.

The contract price paid per square meter for architectural texture of the types listed in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in architectural texture, complete in place, including test panels, painting textured surface and anti-graffiti protective coating, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## **COST REDUCTION INCENTIVE PROPOSALS FOR CAST-IN-PLACE PRESTRESSED BOX GIRDER BRIDGES**

Except as provided herein, cast-in-place prestressed box girder bridges shall be constructed in conformance with the details shown on the plans and the provisions in Section 50, "Prestressing Concrete," and Section 51, "Concrete Structures," of the Standard Specifications.

If the Contractor submits cost reduction incentive proposals for cast-in-place prestressed box girder bridges, the proposals shall be in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications and these special provisions.

The Engineer may reject any proposal which, in the Engineer's judgment, may not produce a structure which is at least equivalent to the planned structure.

At the time the cost reduction incentive proposal (CRIP) is submitted to the Engineer, the Contractor shall also submit 4 sets of the proposed revisions to the contract plans, design calculations, and calculations from an independent checker for all changes involved in the proposal, including revisions in camber, predicted deck profile at each construction stage, and falsework requirements to the Office of Structure Design, Documents Unit, P.O. Box 942874, Sacramento, CA 94274-0001 (1801 30th Street, Sacramento, CA 95816), telephone (916) 227-8230. When notified in writing by the Engineer, the Contractor shall submit 12 sets of the CRIP plan revisions and calculations to the Office of Structure Design for final approval and use during construction. The calculations shall verify that all requirements are satisfied. The CRIP plans and calculations shall be signed by an engineer who is registered as a Civil Engineer in the State of California.

The CRIP plans shall be either 279 mm x 432 mm, or 559 mm x 864 mm in size. Each CRIP plan sheet and calculation sheet shall include the State assigned designations for the contract number, bridge number, full name of the structure as shown on the contract plans, and District-County-Route-Kilometer Post. Each CRIP plan sheet shall be numbered in the lower right hand corner and shall contain a blank space in the upper right hand corner for future contract sheet numbers.

Within 3 weeks after final approval of the CRIP plan sheets, one set of the corrected good quality prints on 75-g/m<sup>2</sup> (minimum) bond paper, 559 mm x 864 mm in size, of all CRIP plan sheets prepared by the Contractor for each CRIP shall be furnished to the Office of Structure Design, Documents Unit.

Each CRIP shall be submitted prior to completion of 25 percent of the contract working days and sufficiently in advance of the start of the work that is proposed to be revised by the CRIP to allow time for review by the Engineer and correction by the Contractor of the CRIP plans and calculations without delaying the work. The Contractor shall allow a minimum of 8 weeks for the review of a CRIP. In the event that several CRIPs are submitted simultaneously, or an additional CRIP is submitted for review before the review of a previously submitted CRIP has been completed, the Contractor shall designate the sequence in which the CRIPs are to be reviewed. In this event, the time to be provided for the review of any proposal in the sequence shall be not less than the review time specified herein for that proposal, plus 2 weeks for each CRIP of higher priority which is still under review.

Should the review not be complete by the date specified in the Contractor's CRIP, or such other date as the Engineer and Contractor may subsequently have agreed to in writing and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in review of CRIP plans and calculations, an extension of time commensurate with the delay in completion of the work thus caused will be granted as provided in Section 8-1.07, "Liquidated Damages," of the Standard Specifications except that the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications shall not apply.

Permits and approvals required of the State have been obtained for the structures shown on the plans. Proposals which result in a deviation in configuration may require new permits or approvals. The Contractor shall be responsible for obtaining the new permits and approvals before the Engineer will reach a decision on the proposal. Delays in obtaining permits and approvals will not be reason for granting an extension of contract time.

All proposed modifications shall be designed in conformance with the bridge design specifications and procedures currently employed by the Department. The proposal shall include all related, dependent or incidental changes to the structure and other work affected by the proposal. The proposal will be considered only when all aspects of the design changes are included for the entire structure. Changes, such as but not limited to, additional reinforcement and changes in location of reinforcement, necessary to implement the CRIP after approval by the Engineer, shall be made at the Contractor's expense.

Modifications may be proposed in (1) the thickness of girder stems and deck slabs, (2) the number of girders, (3) the deck overhang dimensions as specified herein, (4) the amount and location of reinforcing steel, (5) the amount and location of prestressing force in the superstructure, and (6) the number of hinges, except that the number of hinges shall not be increased. The strength of the concrete used may be increased but the strength employed for design or analysis shall not exceed 42 MPa.

Modifications proposed to the minimum amount of prestressing force which must be provided by full length draped tendons are subject to the provisions in "Prestressing Concrete" of these special provisions.

No modifications will be permitted in (1) the foundation type, (2) the span lengths or (3) the exterior dimensions of columns or bridge superstructure, except that the overhang dimension from face of exterior girder to the outside edge of roadway deck may be uniformly increased or decreased by 25 percent on each side of the box girder section. Fixed connections at the tops and bottoms of columns shown on the plans shall not be eliminated.

The Contractor shall be responsible for determining construction camber and obtaining the final profile grade as shown on the plans.

The Contractor shall reimburse the State for the actual cost of investigating CRIPs for cast-in-place prestressed box girder bridges submitted by the Contractor. The Department will deduct this cost from any moneys due, or that may become due the Contractor under the contract, regardless of whether or not the proposal is approved or rejected.

## CURING

The formed surfaces which will be exposed in the completed work, of the columns, caps, piers, bents, or abutments listed in the following table shall be cured by the forms-in-place method. Other surfaces of said units shall be cured in conformance with the provisions in Section 90-7.03, "Curing Structures," of the Standard Specifications.

Bridge Name & Number	Abutment Number	Pier or Bent Number
Douglas – Sunrise Connector OC	6	5

## **DECK CRACK TREATMENT**

The Contractor shall use all means necessary to minimize the development of shrinkage cracks.

The Contractor shall remove all equipment and materials from the deck and clean the surface as necessary for the Engineer to measure the surface crack intensity. Surface crack intensity will be determined by the Engineer after completion of concrete cure, prior to prestressing, and prior to the release of falsework. In any 50-m<sup>2</sup> portion of deck within the limits of the new concrete deck, should the intensity of cracking be such that there are more than 5 m of cracks whose width at any location exceeds 0.5-mm, the deck shall be treated with methacrylate resin. The area of deck to be treated shall have a width that extends for the entire width of new deck inside the concrete barriers and a length that extends at least 1.5 m beyond the furthest single continuous crack outside the 50-m<sup>2</sup> portion, measured from where that crack exceeds 0.5-mm in width, as determined by the Engineer.

Deck crack treatment shall consist of test sealing, and furnishing and applying methacrylate resin in conformance with the requirements of these special provisions. If grinding operation is required, deck treatment shall take place after grinding.

Prior to the start of deck treatment work, the Contractor shall submit for approval by the Engineer, a program for public safety associated with the use of methacrylate resin. The program shall identify materials, equipment, and methods to be used. The Contractor shall not perform deck treatment work, other than that specifically authorized in writing by the Engineer, until the program has been approved.

If the measures being taken by the Contractor are inadequate to provide for public safety associated with use of methacrylate resin, the Engineer will direct the Contractor to revise the operations and the public safety program. Directions for revisions will be in writing and will specify the items in which the Contractor's program is inadequate. No further deck treatment shall be performed until public safety measures are adequate, and a revised program for public safety has been approved.

The Engineer will notify the Contractor of the approval or rejection of any submitted or revised program for public safety associated with the use of methacrylate resin within 10 working days of receipt of the final submitted program.

The State will not be liable to the Contractor for failure to approve all or any portion of an originally submitted or revised program for public safety associated with the use of methacrylate resin, nor for any delays to the work due to the Contractor's failure to submit an acceptable program for public safety associated with the use of methacrylate resin. If the Engineer does not review or approve the program submitted by the Contractor within the time specified and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the program for public safety, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

The Contractor shall furnish an airborne emissions monitoring plan prepared by a certified industrial hygienist. Emissions will be monitored at a minimum of 4 points including the point of mixing, the point of application, and the point of nearest public contact, as determined by the Engineer. At the completion of work, a report by the certified industrial hygienist with results of the airborne emissions monitoring plan shall be furnished to the Engineer.

## Materials

The material used for treating the deck shall be a low odor, high molecular weight methacrylate resin. Prior to adding initiator, the resin shall have a maximum volatile content of 30 percent when tested in conformance with the requirements in ASTM Designation: D 2369, and shall conform to the following:

PROPERTY	TEST METHOD	REQUIREMENT
Viscosity mPa·s, maximum, (Brookfield RVT with UL adaptor, 50 RPM at 25°C)	ASTM D 2196	0.025
Specific Gravity minimum, at 25°C	ASTM D 1475	0.90
Flash Point °C, minimum	ASTM D 3278	82
Vapor Pressure mm Hg, maximum, at 25°C	ASTM D 323	1.0
Tack-free time minutes, maximum at 25°C	California Test 551	400
PCC Saturated Surface-Dry Bond Strength MPa, minimum at 24 hours and 21±1°C	California Test 551	3.5
* Test shall be performed prior to adding initiator.		

A Material Safety Data Sheet shall be furnished prior to use for each shipment of high molecular weight methacrylate resin.

The promoter and initiator, if supplied separately from the resin, shall not be mixed directly with each other. Containers of promoters and initiators shall not be stored together in a manner that will allow leakage or spillage from one to contact the containers or material of the other.

## Testing

The Contractor shall allow 14 days for sampling and testing by the Engineer of the high molecular weight methacrylate resin prior to proposed use.

The Contractor shall treat a test area within the project limits of approximately 50 m<sup>2</sup> at a location approved by the Engineer. Conditions during the test treatment shall be similar to those expected on the deck. Equipment used in the test shall be similar to those used for the deck treating operations. If the test area is on the traveled way, traffic shall not be allowed on the treated test area until (1) the treated surface is tack free (non-oily), (2) the sand cover adheres sufficiently to resist brushing by hand, and (3) the coefficient of friction of the deck is at least 0.35 when tested in conformance with the requirements in California Test 342.

Should the above requirements for traffic use not be met, the Contractor shall suspend treating of bridge decks until another test area is treated and complies with the requirements.

## Construction

Prior to deck treatment with methacrylate resin, the bridge deck surface shall be cleaned by abrasive blasting and all loose material shall be blown from visible cracks using high-pressure air. Concrete curing seals shall be cleaned from the deck surface to be treated, and the deck shall be dry when blast cleaning is performed. If the deck surface becomes contaminated at any time prior to placing the penetrating sealer, the deck surface shall be cleaned by abrasive blasting.

Equipment shall be fitted with suitable traps, filters, drip pans, or other devices as necessary to prevent oil or other deleterious material from being deposited on the deck.

Where abrasive blasting is being performed within 3 m of a lane occupied by public traffic, the residue including dust shall be removed immediately after contact between the abrasive and the surface being treated. The removal shall be by a

vacuum attachment operating concurrently with the abrasive blasting operation.

The relative humidity shall be less than 90 percent at time of treatment.

A compatible promoter/initiator system shall be capable of providing a resin gel time of not less than 40 minutes nor more than 1.5 hours at the temperature of application. Gel time shall be adjusted to compensate for the changes in temperature throughout treatment application.

The quantity of resin mixed with promoter and initiator shall be limited to 20 L at a time for manual application.

Machine application of the resin shall be performed by using a two-part resin system using a promoted resin for one part and an initiated resin for the other part. This two-part resin system shall be combined at equal volumes to the spray bars through separate positive displacement pumps. Combining of the 2 components shall be by either static in-line mixers or by external intersecting spray fans. The pump pressure at the spray bars shall not be great enough to cause appreciable atomization of the resin. Compressed air shall not be used to produce the spray. A shroud shall be used to enclose the spray bar apparatus. Hand held spray apparatus shall not be used.

The Contractor shall allow methacrylate resin to be applied only to the specified area. Barrier rails, joints, and drainage facilities shall be adequately protected to prevent contamination by the treatment material. Contaminated items shall be repaired at the Contractor's expense.

The prepared area shall be dry and the surface temperature shall be less than or equal to 38°C when the resin is applied. The rate of application of promoted/initiated resin shall be approximately 2.5 square meters per liter,  $\pm 0.1$  square meter per liter.

The deck surfaces to be treated shall be flooded with resin, allowing penetration into the concrete and filling of all cracks. The treatment shall be applied within 5 minutes after complete mixing. A significant increase in viscosity shall be cause for rejection. Excess material shall be redistributed by squeegees or brooms within 10 minutes after application.

After the resin has been applied, at least 20 minutes shall elapse before applying sand. The sand shall be commercial quality dry blast sand. Ninety-five percent of the sand shall pass the 2.36-mm sieve, and 95 percent shall be retained on the 850- $\mu$ m sieve. The sand shall be applied at a rate of one kilogram per square meter,  $\pm 0.1$  kilogram per square meter.

Excess sand shall be removed from the deck surface by vacuuming or sweeping prior to opening to traffic.

Traffic shall not be allowed on the treated area until (1) the treated surface is tack free (non-oily), (2) the sand cover adheres sufficiently to resist brushing by hand, and (3) the coefficient of friction of the deck is at least 0.35 when tested in conformance with the requirements in California Test 342.

## **MEASUREMENT AND PAYMENT**

Full compensation for roughening existing concrete surfaces to a full amplitude of approximately 6 mm, where shown on the plans, shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge and no separate payment will be made therefor.

Full compensation for furnishing and installing access opening covers in soffits of new cast-in-place box girder bridges shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge and no separate payment will be made therefor.

Full compensation for furnishing and installing plastic pipe located at vertical drains used behind retaining walls and bridge abutments, including horizontal or sloping drains down slopes and across sidewalk areas, including excavation and backfill involved in placing the plastic pipe, shall be considered as included in the contract price paid per cubic meter for the various items of concrete work involved and no separate payment will be made therefor.

Full compensation for deck crack treatment, including a program for public safety and airborne monitoring, shall be considered as included in the contract price paid per cubic meter for structural concrete, bridge and no additional compensation will be allowed therefor.

### **10-1.43 PTFE SPHERICAL BEARING**

PTFE spherical bearings, consisting of polytetrafluoro-ethylene (PTFE) and stainless steel bearing surfaces, structural steel plates and anchors shall conform to the details shown on the plans and these special provisions.

PTFE spherical bearings shall be expansion type with spherical and sliding bearing surfaces.

The manufacturer of the PTFE spherical bearings shall show evidence that PTFE spherical bearings furnished by the same manufacturer and used in conditions similar to this application have had at least 3 years of satisfactory service at each of 2 projects.

A qualified representative of the manufacturer shall be present during installation of the first bearing and shall be available for advice during any remaining installations.

The Contractor shall submit working drawings of the PTFE spherical bearings to the Office of Structure Design (OSD) for approval in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. For initial review, 4 sets shall be submitted. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to OSD for final approval and for use during construction.

The working drawings for PTFE spherical bearings shall include a description of the method of mechanical interlocking of the PTFE fabric to the metallic substrate for the PTFE bearing sole plate during concrete placement.

Working drawings shall be 279 mm x 432 mm or 559 mm x 864 mm in size and each drawing and calculation sheet shall include the name of the structure as shown on the contract plans, District-County-Route, bridge number, and contract number.

Working drawings shall be submitted sufficiently in advance of the start of the affected work to allow time for review by the Engineer and correction by the Contractor of the drawings without delaying the work. The time shall be proportional to the complexity of the work but in no case shall the time be less than 6 weeks after complete drawings and all support data are submitted.

At the completion of each structure on the contract, one set of reduced prints on 75-g/m<sup>2</sup> (minimum) bond paper, 279 mm x 432 mm in size, of the corrected original tracings of all working drawings for each structure shall be furnished to the Engineer. Reduced prints of drawings which are common to more than one structure shall be submitted for each structure. An index prepared specifically for the drawings for each structure containing sheet numbers and titles shall be included on the first reduced print in the set for each structure. Reduced prints for each structure shall be arranged in the order of drawing numbers shown in the index.

The edge of the corrected original tracing image shall be clearly visible and visually parallel with the edges of the page. A clear, legible symbol shall be provided as near to the upper left side of each page as is feasible within the original print to show the amount of reduction and a horizontal and vertical scale shall be provided on each reduced print to facilitate enlargement to original scale.

PTFE spherical bearings shall be installed on surfaces prepared in conformance with the provisions in Section 55-3.19, "Bearings and Anchorages," of the Standard Specifications.

The manufacturer shall furnish Certificates of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for all material used in the PTFE spherical bearings. The certification shall be supported by a copy of the results of all proof tests performed on the bearings.

PTFE surfaces of PTFE spherical bearings shall be unfilled PTFE fabric made from virgin PTFE oriented multifilament and other fibers. The resin in the filaments shall be virgin PTFE material (not reprocessed) in conformance with the requirements of ASTM Designation: D 4441.

At the highest point of substrate and after compression, the PTFE fabric shall have a minimum thickness of 1.6 mm and a maximum thickness of 3.2 mm.

Flat stainless steel surfaces shall be a weld overlay on structural steel plate, or solid or sheet stainless steel conforming to the requirements of ASTM Designation: A 240, Type 304 with a minimum thickness of 3.2 mm.

Curved stainless steel surfaces shall be solid stainless steel conforming to the requirements of ASTM Designation: A 240, Type 304.

Curved stainless steel surfaces with dimensions shown on the plans exceeding 101.6 mm in thickness shall be either a weld overlay on structural steel plate or solid stainless steel conforming to the requirements of ASTM Designation: A 240, Type 304. Stainless steel sheet will not be allowed.

When a weld overlay is used for stainless steel surfacing, the overlay shall be placed by submerged arc welding using Type 309L electrodes. The finished overlay shall have a 2.38 mm minimum thickness after welding, grinding and polishing. Prior to welding, the manufacturer must submit a complete weld procedure to the Engineer for approval.

When stainless steel sheets are used for stainless steel surfacing, the sheets shall be attached by perimeter arc welding using Type 309L electrodes. After completion of the weld operation, the stainless steel surface shall be smooth and free from waves.

Steel plates, except stainless steel, shall conform to the requirements of ASTM Designation: A 709/A 709, Grade 36 [250], 50 [345], or 50W [345W].

Welding of structural steel shall conform to the requirements of AWS D1.1. Welding of structural steel to stainless steel shall conform to the requirements of AWS D1.6.

Convex plate radius dimension tolerances shall be 0.000 to -250  $\mu$ m. Concave plate radius dimensions shall be +250 to 0.000  $\mu$ m.

The bearing manufacturer shall have full size convex and concave metal templates for the 2 spherical surfaces of each bearing radius. The templates shall be available to the inspector during all bearing inspections.

The PTFE fabric on spherical or sliding bearing surfaces shall be epoxy bonded and mechanically interlocked to the steel substrate. All bonding shall be done under controlled factory conditions. The mechanical interlock on the spherical concave surface must be integrally machined into the steel substrate. Welded retention grids will not be allowed on the concave surface. Any edges, other than the selvage shall be oversown or recessed so that no cut fabric edges are exposed.

After completion of the bonding operation the PTFE surface shall be smooth and free from bubbles.

The surface of the bearing elements shall be controlled such that upon completion of the bearing assembly the PTFE to stainless steel interface shall be in full bearing.



The mating surface of the flat stainless steel with the PTFE surfacing shall have a minimum #8 mirror finish as determined in conformance with the requirements in ANSI Standard B46.1. The mating surface of the curved stainless steel with the PTFE surfacing shall have a finish of less than 0.4  $\mu\text{m}$  root-mean-square (rms), as determined in conformance with the requirements in ANSI Standard B46.1.

Metal surfaces of bearings exposed to the atmosphere and in contact with the structure of the completed work, except stainless steel surfaces, shall be cleaned and painted in conformance with the provisions in Sections 59-2, "Painting Structural Steel," and 91, "Paint" of the Standard Specifications, and "Clean and Paint Structural Steel" of these special provisions.

Certification in conformance with the requirements in SSPC-QP 1, SSPC-QP 2, and SSPC-QP 3 of the "SSPC: The Society for Protective Coatings" will not be required for PTFE spherical bearings.

Finish coats will not be required on the bearings.

PTFE spherical bearing assemblies shall be assembled at the factory. Each assembly shall have a minimum of 4 temporary steel straps which are bolted to threaded holes in the masonry and sole plates so that the entire assembly is shipped as a unit and remains intact when uncrated and installed. Welding of the steel straps will not be allowed. Straps must be adequate for vertical lifting purposes. Bearing dismantling will only be allowed under the direction and in the presence of the Engineer.

During fabrication, the maximum temperature of bonded PTFE surfaces shall be 150°C.

Damaged bearings and bearings with scratched mating surfaces shall be returned to the factory for replacement or resurfacing.

PTFE spherical bearing sole plates shall be temporarily supported during concrete placement. Temporary supports shall prevent the rotation or displacement of the bearing during concrete placing operations. Temporary supports shall not inhibit the functioning of the PTFE spherical bearing after concrete is placed. Temporary supports shall not restrict the movement at bridge joints due to temperature changes and shortening from prestress forces. Materials for temporary supports within the limits for placing concrete shall conform to the requirements for form fasteners.

PTFE spherical bearings shall have a first movement static coefficient of friction not exceeding 0.06.

Prior to proof testing, all bearings shall be permanently die-stamped on 2 of 4 sides with markings consisting of bearing number and contract number. Each bearing shall have a unique bearing number and match marks on plate edges to insure correct assembly at the job site.

Full sized PTFE spherical bearings shall be proof tested and evaluated for compression and coefficient of friction in the presence of the Engineer. The proof tests shall be performed on samples randomly selected by the Engineer from the production bearings to be used in the work. Proof testing shall be performed by the Contractor at the manufacturer's plant or at an approved laboratory. If proof tests can not be performed at the specified load, the Contractor shall submit to the Engineer for review and approval a testing plan listing additional physical tests. These tests shall be performed in the presence of the Engineer and shall demonstrate that the requirements for proof testing at the specified load are satisfied. The Contractor shall give the Engineer at least 7 days notice before beginning proof testing. Proof testing of PTFE spherical bearings shall conform to the following requirements:

- A. One bearing per lot of production bearings shall be proof tested. A lot is defined as 25 bearings or fraction thereof of the same type, within a load category. Bearings in two load categories with vertical load capacities within 800 kN of each other will be considered in one load category for testing.
- B. The expansion type bearings shall be proof tested for compression and coefficient of friction.
- C. A load category shall consist of bearings of differing vertical load capacity within a range defined as follows:
  1. Bearings with less than or equal to 2225 kN maximum vertical load capacity.
  2. Bearings with greater than 2225 kN but less than or equal to 8900 kN maximum vertical load capacity.
  3. Bearings with more than 8900 kN maximum vertical load capacity.
- D. Proof tests for compression: The bearing shall be held at the design rotation or 0.02 radians whichever is greater for one hour at 1.5 times the maximum vertical load shown on the plans for the bearing. The device shall be in a rotated position during the test. The rotation may be imposed on the bearing by inserting a beveled plate between the bearing and the restraining surface prior to loading.
- E. Proof tests for coefficient of friction: The tests shall be performed at the minimum vertical load shown on the plans for the bearing with the test load applied for 12 hours prior to friction measurement and the following:
  1. The tests shall be arranged to allow measurement of the static coefficient of friction on the first movement of the bearing.
  2. The first movement static and dynamic coefficients of friction shall be measured at a sliding speed not

exceeding 25 millimeters per minute and shall not exceed the specified coefficient of initial static friction.

3. The test bearings shall be subjected to a minimum of 100 movements of at least 25 mm of relative movement at a sliding speed not exceeding 300 millimeters per minute. After cycling, the first movement static and dynamic coefficients of friction shall be measured again at a sliding speed not exceeding 25 millimeters per minute and shall not exceed the specified coefficient of initial static friction.
- F. The bearing surfaces shall be cleaned prior to proof testing.
- G. Proof testing of bearings shall be done after conditioning specimens for 12 hours at  $21^{\circ}\pm 8^{\circ}\text{C}$ .
- H. The proof tested bearings shall show no visible sign of: (1) bond failure of bearing surfaces, (2) separation or lift-off of plates from each other or from PTFE surfaces, or (3) other defects. When a proof tested bearing fails to comply with these specifications, all bearings in that lot shall be individually tested for acceptance.
- I. Proof test results shall be certified correct and signed by the testing laboratory personnel who conducted the test and interpreted the test results. Proof test results shall include the bearing numbers of the bearings tested.

Quantities of PTFE spherical bearings will be determined as units from actual count in the completed work. A PTFE spherical bearing with more than one PTFE surface shall be considered a single PTFE spherical bearing.

The contract unit price paid for PTFE spherical bearing shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the bearing, complete in place, including masonry and sole plates, anchor bolts and sleeves, mortaring of bolts, temporary supports, proof testing, and cleaning and painting of PTFE spherical bearings, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

If a portion or all of PTFE spherical bearings are either fabricated or tested at a site more than 480 air line kilometers from both Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Whereas it is and will be impractical and extremely difficult to ascertain and determine the actual increase in such expenses, it is agreed that payment to the Contractor for PTFE spherical bearings will be reduced \$5,000 for each fabrication or testing site located more than 480 air line kilometers from both Sacramento and Los Angeles and an additional \$10,000 (\$15,000 total) for each fabrication or testing site located more than 4800 air line kilometers from both Sacramento and Los Angeles.

#### **10-1.44 JOINT SEAL ASSEMBLIES (MAXIMUM MOVEMENT RATING, 100 mm)**

Joint seal assemblies shall conform to the details shown on the plans, the provisions in Section 51, "Concrete Structures," of the Standard Specifications, and these special provisions.

All metal parts of the joint seal assembly shall conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications. Bolts, nuts, and washers shall conform to the requirements in ASTM Designation: A 325 or A 325M.

At the Contractor's option, cleaning and painting of all new metal surfaces of the joint seal assembly, except stainless steel and anchorages embedded in concrete, may be substituted for galvanizing. Cleaning and painting shall be in conformance with the provisions in "Clean and Paint Structural Steel" of these special provisions.

Certification in conformance with the requirements in SSPC-QP 1, SSPC-QP 2, and SSPC-QP 3 of the "SSPC: The Society for Protective Coatings" will not be required for cleaning and painting joint seal assemblies.

Finish coats will not be required on joint seal assemblies.

Sheet neoprene shall conform to the provisions for neoprene in Section 51-1.14, "Waterstops," of the Standard Specifications. The sheet neoprene shall be fabricated to fit the joint seal assembly accurately.

Metal parts of the joint seal assembly shall be pre-assembled before installation to verify the geometry of the completed seal.

The bridge deck surface shall conform to the provisions in Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications prior to placing and anchoring the joint seal assembly.

The assembly shall be placed in a blocked out recess in the concrete deck surface. The depth and width of the recess shall permit the installation of the assembly anchorage components or anchorage bearing surface to the lines and grades shown on the plans.

Sheet neoprene shall be installed at such time and in such manner that the sheet neoprene will not be damaged by construction operations. The joint shall be cleaned of all dirt, debris and other foreign material immediately prior to installation of the sheet neoprene.

#### **ALTERNATIVE JOINT SEAL ASSEMBLY**

At the Contractor's option, an alternative joint seal assembly may be furnished and installed provided: (1) that the quality of the alternative and its suitability for the intended application are at least equal to that of the joint seal assembly shown on the plans, (2) that acceptable working drawings and a Certificate of Compliance are furnished as specified herein

and (3) that the alternative conforms to the following requirements:

- A. The determination as to the quality and suitability of a joint seal assembly will be made in the same manner as provided in Section 6-1.05, "Trade Names and Alternatives," of the Standard Specifications. The factors to be considered will include: the ability of the assembly to resist the intrusion of foreign material and water throughout the full range of movement for the application, and the ability to function without distress to any component.
- B. Joint seal assemblies will not be considered for approval unless it can be proven that the assembly has had at least one year of satisfactory service under conditions similar to this application.
- C. The Contractor shall submit complete working drawings for each joint seal assembly to the Division of Structure Design (DSD) in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The working drawings shall show complete details of the joint seal assembly and anchorage components and the method of installation to be followed, including concrete blockout details and additions or rearrangements of the reinforcing steel from that shown on the plans. For initial review, 5 sets of working drawings shall be submitted. After review, between 6 and 12 sets of working drawings, as requested by the Engineer, shall be submitted to DSD for final approval and use during construction.
- D. The working drawings shall be supplemented with calculations for each proposed joint seal assembly, as requested by the Engineer. Working drawings shall be either 279 mm x 432 mm or 559 mm x 864 mm in size. Each drawing and calculation sheet shall include the State assigned designations for the contract number, bridge number, full name of the structure as shown on the contract plans, and District-County-Route-Kilometer Post. The design firm's name, address, and telephone number shall be shown on the working drawings. Each sheet shall be numbered in the lower right hand corner and shall contain a blank space in the upper right hand corner for future contract sheet numbers.
- E. Calculations, when requested, and working drawings, shall be stamped and signed by an engineer who is registered as a Civil Engineer. The Contractor shall allow the Engineer 4 weeks to review the drawings after a complete set has been received.
- F. Within 3 weeks after final working drawing approval, one set of the corrected good quality prints on 75 g/m<sup>2</sup> (minimum) bond paper (559 mm x 864 mm in size) of all working drawings prepared by the Contractor for each joint seal assembly shall be furnished to DSD.
- G. Each shipment of joint seal materials shall be accompanied by a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The certificate shall state that the materials and fabrication involved comply in all respects to the specifications and data submitted in obtaining the approval.
- H. The elastomer portion of the joint seal assembly shall be neoprene conforming to the requirements in Table 1 of ASTM Designation: D 2628 and the following, except that no recovery tests or compression-deflection tests will be required:

Property	Requirement	ASTM Test Method
Hardness, Type A Durometer, points	55-70	D 2240 (Modified)
Compression set, 70 hours at 100°C, maximum, percent	40	D 395 Method B (Modified)

- I. All metal parts of an alternative joint seal assembly shall conform to the requirements above for the joint seal assembly shown on the plans. At the Contractor's option, metal parts may conform to the requirements in ASTM Designation: A 572/A 572M.
- J. The assembly and its components shall be designed to support the AASHTO HS20-44 loading with 100 percent impact. The tire contact area used to distribute the tire loads shall be 244 mm, measured normal to the longitudinal axis of the assembly, by 508 mm wide. The assembly shall provide a smooth riding joint without slapping of components or wheel tire rumble.
- K. The Movement Rating of the assembly shall be measured normal to the longitudinal axis of the assembly. The dimensions for positioning the assembly within the Movement Rating during installation shall be measured normal to the longitudinal axis, disregarding any skew of the deck expansion joint.
- L. The assembly shall have cast-in-place anchorage components forming a mechanical connection between the joint components and the concrete deck.
- M. The maximum depth and width of the recess shall be such that the primary reinforcement to provide the necessary strength of the structural members is outside the recess. The maximum depth of the recess at abutments shall be 250 mm. The maximum width of the recess on each side of the expansion joint shall be 300 mm.
- N. All reinforcement other than the primary reinforcement shall continue through the recess construction joint into the

recess and engage the anchorage components of the assembly.

- O. Horizontal angle points and vertical corners at curbs in assemblies shall consist of either pre-molded sections or standard sections of the joint seal assembly that have been specially miter cut or bent to fit the structure.
- P. The elastomer portion of the assembly shall be installed in conformance with the manufacturer's recommendations at such time and in such a manner that the elastomer portion will not be damaged by construction operations. The joint and blockout shall be cleaned of all dirt, debris, and other foreign material immediately prior to the installation of the elastomer.

Full compensation for additional materials or work required because of the application of the optional cleaning and painting or the use of an alternative type joint seal assembly, shall be considered as included in the contract price paid per meter for the joint seal assembly involved and no additional compensation will be allowed therefor.

### **ARCHITECTURAL FINISH (EXPOSED AGGREGATE)**

Exposed aggregate architectural finish on concrete surfaces shall conform to the details shown on the plans and the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

Facing aggregate for exposed aggregate finish for precast concrete surfaces shall be river gravel, exclusive of crushed gravel and rock, with 19 mm primary aggregate size. Precast panels may be cast with facing aggregate up or down on the casting bed, at the option of the Contractor. The aggregate facing mix shall be separately prepared, applied to the form or fresh concrete, and its integrity maintained during the casting process, so that the facing shall be cast integrally with the concrete wall panel, and the entire panel is homogeneous and structurally monolithic. The facing rock shall be placed finger width apart in a pattern of randomly distributed colors and sizes. Matrix shall be removed from the front face of the panel to expose the facing aggregate to a depth of 25 mm to 38 mm. Exposed aggregate finish shall have cement film, discoloring agents, dirt, dust, grease, loose concrete and other foreign material removed and shall be uniform in appearance.

### **TEST PANEL**

A test panel at least 1.25 m x 1.25 m in size shall be successfully completed at a location approved by the Engineer before beginning work on architectural finishes. The test panel shall be constructed and finished with the materials, tools, equipment and methods to be used in constructing the architectural finish. If ordered by the Engineer, additional test panels shall be constructed and finished until the specified finish, texture and color are obtained, as determined by the Engineer.

The test panel approved by the Engineer shall be used as the standard of comparison in determining acceptability of architectural finish applied to concrete surfaces.

Facing aggregate shall match the variegated colors and color distribution found in the natural aggregates at Plum Creek.

### **CURING**

Precast panels shall be cured in conformance with the provisions in Section 90-7.01D, "Forms-In-Place Method," or 90-7.04, "Curing Precast Concrete Members," of the Standard Specifications. Curing compounds shall not be used on exposed aggregate finish.

### **SEALING**

After completion of cure and surface finishing, the surfaces of the Earth Retaining System shall be sealed with a concrete sealant in conformance with the following:

- A. The concrete sealant shall be a product designed to seal concrete against moisture. The sealant shall be 40 percent, minimum, organosilane solution, diluted in a suitable solvent, and shall consist of alkyltrimethoxysilanes with alkyl groups of i-butyl, i-octyl, n-octyl, singularly or in combination. The sealant shall be tinted with a fugitive dye so that the surface of the member remains colored, for a minimum of 4 hours and a maximum of 7 days, after application of the sealant.
- B. The sealant shall seal the surfaces of the member so that 5 days after application of the sealant, there shall be no change in the appearance of the surface when sprayed with water.
- C. Wall surfaces shall be dry for a minimum of 48 hours prior to applying the sealant.
- D. Each shipment of concrete sealant shall be accompanied by the manufacturer's recommendations for application and a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.
- E. Unless otherwise specified, the sealant shall be applied in conformance with the manufacturer's recommendations.
- F. The sealant shall be applied when the atmospheric temperature is between 5°C and 38°C and the wind velocity is less than 2.25 m/s. The sealant shall be applied at a coverage rate of approximately 3.0 m<sup>2</sup>/L, using an airless

sprayer with a maximum pressure of 140 kPa. The sprayer shall be equipped with a calibrated pressure gauge showing the pressure during the spraying operation.

- G. Subject to written approval of the Engineer, the Contractor may provide suitable enclosures to permit sealing of the members during inclement weather and may use rollers to apply the sealant for small areas.
- H. Twenty-four hours after application of the concrete sealant, the Contractor shall apply a fine water spray using water in conformance with the provisions in Section 90-2.03, "Water," of the Standard Specifications. The spray shall be applied uniformly to the surfaces of the member until they are completely wet. There shall not be excessive runoff of water resulting from the spraying operation.
- I. Five days after the sealant application, the Contractor shall spray surfaces of the member, in areas designated by the Engineer, with a water spray to verify sealant coverage. Surfaces that lack sufficient sealant coverage shall be sealed again, in conformance with the provisions specified herein.

## **MEASUREMENT AND PAYMENT**

Full compensation for exposed aggregate architectural finish and sealing concrete surfaces shall be considered as included in the contract price paid per square meter for earth retaining structure and no separate payment will be made therefor.

### **10-1.45 REINFORCEMENT**

Reinforcement shall conform to the provisions in Section 52, "Reinforcement," of the Standard Specifications and these special provisions.

Individual hoops, made continuous with butt welded splices, which are substituted for spiral reinforcement, shall conform to the requirements for "Ultimate Butt Splices" of these special provisions.

#### **ULTIMATE BUTT SPLICES**

Ultimate butt splices shall be either welded or mechanical splices, shall be used at the locations shown on the plans, and shall conform to the provisions in Section 713, "Reinforcement," of the Standard Specifications and these special provisions.

#### **General Requirements**

The Contractor shall designate in writing an ultimate butt splicing Quality Control Manager (QCM). The QCM shall be responsible directly to the Contractor for 1) the quality of all ultimate butt splicing including the inspection of materials and workmanship performed by the Contractor and all subcontractors; and 2) submitting, receiving, and approving all correspondence, required submittals, and reports regarding ultimate butt splicing to and from the Engineer.

The QCM shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors, who will provide other services or materials for the project. The QCM may be an employee of the Contractor.

The length of any type of ultimate mechanical butt splice shall not exceed 10 times the bar diameter of the larger bar to be spliced.

All ultimate prejob, production, and job control sample splices shall be 1) a minimum length of 1.5 meters for reinforcing bars No. 25 or smaller and 2 meters for reinforcing bars No. 29 or larger, with the splice located at mid-point, and 2) suitably identified prior to shipment with weatherproof markings that do not interfere with the Engineer's tamper-proof markings or seals. Any splice that shows signs of tampering will be rejected.

A minimum of one control bar shall be removed from the same bar as, and adjacent to, all ultimate prejob, production, and job control sample splices. Control bars shall be 1) a minimum length of one meter for reinforcing bars No. 25 or smaller and 1.5 meters for reinforcing bars No. 29 or larger, and 2) suitably identified prior to shipment with weatherproof markings that do not interfere with the Engineer's tamper-proof markings or seals. The portion of adjacent bar remaining in the work shall also be identified with weatherproof markings that correspond to its adjacent control bar.

Shorter length sample splice and control bars may be furnished if approved in writing by the Engineer.

Each sample splice and its associated control bar shall be identified and marked as a set. Each set shall be identified as representing a prejob, production, or job control sample splice.

The portion of hoop reinforcing bar, removed to obtain a sample splice and control bar, shall be replaced using a prequalified ultimate mechanical butt splice, or the hoop shall be replaced in kind.

Section 52-1.08E, "Job Control Tests," of the Standard Specifications shall not apply.

The provisions for total slip shall not apply to any ultimate splices that are welded or that are used on hoops.

The independent qualified testing laboratory used to perform the testing of all ultimate butt sample splices and control bars shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors who will provide other services or materials for the project, and shall have the following:

- A. Proper facilities, including a tensile testing machine capable of breaking the largest size of reinforcing bar to be tested.
- B. A device for measuring the total slip of the reinforcing bars across the splice to the nearest 25  $\mu\text{m}$ , that, when placed parallel to the longitudinal axis of the bar is able to simultaneously measure movement across the splice, at 2 locations, 180 degrees apart.
- C. Operators who have received formal training for performing the testing requirements of ASTM Designation: A 370/A 370M and California Test 670.
- D. A record of annual calibration of testing equipment performed by an independent third party that has 1) standards that are traceable to the National Institute of Standards and Technology, and 2) a formal reporting procedure, including published test forms.

#### **Ultimate Butt Splice Test Criteria**

Ultimate prejob, production, and job control sample splices shall be tensile tested in conformance with the requirements described in ASTM Designation: A 370/A 370M and California Test 670.

Ultimate prejob and production sample splices shall rupture in the reinforcing bar either: 1) outside of the affected zone or 2) within the affected zone, provided that the sample has achieved at least 95 percent of the ultimate tensile strength of the control bar associated with the sample. In addition, necking of the bar shall be visibly evident at rupture regardless of whether the bar breaks inside or outside the affected zone.

The affected zone is the portion of the reinforcing bar where any properties of the bar, including the physical, metallurgical, or material characteristics, have been altered by fabrication or installation of the splice.

The ultimate tensile strength of each control bar shall be determined by tensile testing the bar to rupture and shall be determined for all control bars, regardless of where each sample splice ruptures. If 2 control bars are tested for one sample splice, the bar with the lower ultimate tensile strength shall be considered the control bar.

Testing to determine the minimum tensile strength, in conformance with the provisions in the ninth paragraph of Section 52-1.08, "Splicing," of the Standard Specifications, will not be required.

#### **Prejob Test Requirements for Ultimate Butt Splices**

Prior to use in the work, all ultimate butt splices shall conform to the following prejob test requirements:

- A. Eight prejob sample splices for each bar size of each splice type including ultimate mechanical butt splices, ultimate complete joint penetration butt welded splices, and ultimate resistance butt welded splices, that will be used in the work, shall be fabricated by the Contractor. For deformation-dependent types of couplers, 8 sample prejob splices shall also be fabricated for each reinforcing bar size and deformation pattern that will be used in the work.
- B. The sample splices shall be fabricated using the same splice materials, position, operators, location, and equipment, and following the same procedures as will be used to make the splices in the work.
- C. At the option of the Contractor, operator qualification tests may be performed simultaneously with the preparation of prejob sample splices.
- D. If different diameters of hoops are shown on the plans, prejob sample splices, as described above, will only be required for the smallest hoop diameter. In addition, these splices shall be fabricated using the same radius as shown on the plans for these hoops.
- E. Unless otherwise directed in writing by the Engineer, 4 prejob sample splices and control bar sets shall be shipped to the Transportation Laboratory and the remaining 4 sets shall be tested by the Contractor's independent qualified testing laboratory.
- F. Each group of 4 sets from a prejob test shall be securely bundled together and identified by location and contract number with weatherproof markings prior to shipment. Bundles containing fewer than 4 sets will not be tested by the Transportation Laboratory, nor shall they be tested by the independent laboratory.
- G. All 8 sample splices from each prejob test shall conform to the provisions in "Ultimate Butt Splice Test Criteria" specified herein.
- H. Prior to performing any tensile tests on prejob test sample splices, one of the 4 samples shall be tested for, and shall conform to, the provisions for total slip. Should this sample not meet these requirements, one retest, in which the 3 remaining samples are tested for total slip, will be allowed. All 3 of these remaining samples tested shall conform to the aforementioned slip requirements.
- I. For each bundle of 4 sets, a Prejob Test Report shall be prepared by the independent testing laboratory performing the testing. The report shall 1) be signed by an engineer who represents the laboratory and is registered as a Civil Engineer in the State of California; 2) include, as a minimum, the following information for each set: contract number, bridge number, bar size, type of splice, length of mechanical splice, physical condition of test sample splice and control bar, any notable defects, limits of affected zone, total measured slip, location of visible necking area,

ultimate strength of each splice, ultimate strength and 95 percent of this ultimate strength for each control bar, and a comparison between 95 percent of the ultimate strength of each control bar and the ultimate strength of its associated splice; and 3) be submitted to the QCM for review and approval, and then to the Engineer.

- J. Test results for each bundle of 4 sets will be reported in writing to the Contractor within 10 working days after receipt of the bundle by the Transportation Laboratory. In the event that more than one bundle is received on the same day, 2 additional working days shall be allowed for providing test results for each additional bundle received. A test report will be made for each bundle received.
- K. Should the Engineer fail to provide the test results within this time allowance and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in providing the test results, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

#### **Production Test Requirements for Ultimate Butt Splices**

Production tests shall be performed for all ultimate butt splices used in the work. A production test shall consist of 4 sets of sample splices and control bars removed from each lot of completed splices, except when quality assurance tests are performed.

A lot of ultimate butt splices is defined as 1) 150, or fraction thereof, of the same type of ultimate mechanical butt splices used for each bar size and each bar deformation pattern that is used in the work or 2) 150, or fraction thereof, of ultimate complete joint penetration butt welded splices, or ultimate resistance butt welded splices for each bar size used in the work. If different diameters of hoop reinforcement are shown on the plans, separate lots shall be used for each different hoop diameter.

After all splices in a lot have been completed, the QCM shall notify the Engineer in writing that all couplers in this lot conform to the specifications and are ready for testing. The sample splices will either be selected by the Engineer at the job site or a fabrication facility, provided the facility is located within an 80-km radius of the jobsite.

After notification has been received, the Engineer will randomly select the 4 sample splices to be removed from the lot and place tamper-proof markings or seals on them. The Contractor or QCM shall select the adjacent control bar for each sample splice bar, and the Engineer will place tamper-proof markings or seals on them. These ultimate production sample splices and control bars shall be removed by the Contractor, and tested by an independent qualified testing laboratory, in the presence of either the Engineer or the Engineer's authorized representative.

The Engineer or the Engineer's authorized representative will be at the independent qualified testing laboratory within a maximum of 5 working days after receiving written notification that the samples are at the laboratory and ready for testing. Should the Engineer or the Engineer's authorized representative fail to be at the laboratory within this time allowance, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of this action, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

A sample splice or control bar from any set will be rejected if any tamper-proof marking or seal is disturbed prior to testing.

The 4 sets from each production test shall be securely bundled together and identified with a completed sample identification card prior to shipment to the independent laboratory. The card will be furnished by the Engineer. Bundles of samples containing fewer than 4 sets of splices shall not be tested.

A Production Test Report for all testing performed on each lot shall be prepared by the independent testing laboratory performing the testing and submitted to the QCM for review and approval. The report shall be signed by an engineer who represents the laboratory and is registered as a Civil Engineer in the State of California. The report shall include, as a minimum, the following information for each set: contract number, bridge number, lot number and location, bar size, type of splice, length of mechanical splice, physical condition of test sample splice and control bar, any notable defects, limits of affected zone, total measured slip, location of visible necking area, ultimate strength of each splice, ultimate strength and 95 percent of this ultimate strength for each control bar, and a comparison between 95 percent of the ultimate strength of each control bar and the ultimate strength of its associated splice.

The QCM must review, approve, and forward each Production Test Report to the Engineer for review before any splices represented by the report are encased in concrete. The Engineer shall have 3 working days to review each Production Test Report and respond in writing after a complete report has been received. Should the Contractor elect to encase any splices prior to receiving notification from the Engineer, it is expressly understood that the Contractor will not be relieved of the Contractor's responsibility for incorporating material in the work that conforms to the requirements of the plans and specifications. Any material not conforming to these requirements will be subject to rejection. Should the Contractor elect to wait to encase any splices pending notification by the Engineer, and should the Engineer fail to complete the review and provide notification within this time allowance, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in notification, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

Prior to performing any tensile tests on production test sample splices, one of the 4 samples shall be tested for, and shall conform to, the provisions for total slip. Should this sample not meet these requirements, one retest, in which the 3 remaining samples are tested for total slip, will be allowed. Should any of the 3 remaining samples not conform to these requirements, all splices in the lot represented by this production test will be rejected.

If 3 or more sample splices from any production test conform to the provisions in "Ultimate Butt Splice Test Criteria" specified herein, all splices in the lot represented by this production test will be considered acceptable.

Should only 2 sample splices from any production test conform to the provisions in "Ultimate Butt Splice Test Criteria" specified herein, one additional production test shall be performed on the same lot of splices. Should any of the 4 sample splices from this additional test fail to conform to these provisions, all splices in the lot represented by these production tests will be rejected.

If only one sample splice from any production test conforms to the provisions in "Ultimate Butt Splice Test Criteria" specified herein, all splices in the lot represented by this production test will be rejected.

If a production test for any lot fails, the Contractor will be required to repair or replace all reinforcing bars from which sample splices were removed, complete in place, before the Engineer selects any additional splices from this lot for further testing.



Whenever any lot of ultimate butt splices is rejected, additional ultimate butt splices shall not be used in the work until 1) the QCM performs a complete review of the Contractor's quality control process for these splices, 2) a written report is submitted to the Engineer describing the cause of failure for the splices in this lot and provisions for correcting these failures in future lots, and 3) the Engineer has provided the Contractor with written notification that the report is acceptable. The Engineer shall have 3 working days after receipt of the report to provide notification to the Contractor. Should the Engineer not provide notification within this time allowance, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of this action, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

Production tests will not be required on any repaired splice from a lot, regardless of the type of prequalified ultimate mechanical butt splice used to make the repair.

Should an additional production test be required, the Engineer may select any repaired splice for use in the additional production test.

### **Quality Assurance Test Requirements for Ultimate Butt Splices**

For the first production test performed, and for at least one, randomly selected by the Engineer, of every 5 additional production tests, or portion thereof, performed thereafter, the Contractor shall concurrently prepare 4 additional ultimate job control sample splices along with associated control bars. These ultimate job control samples shall be prepared in the same manner as specified herein for ultimate prejob sample splices and control bars.

Each time 4 additional ultimate job control sample splices are prepared, 2 of these job control sample splice and associated control bar sets and 2 of the production sample splice and associated control bar sets, together, shall conform to the requirements for ultimate production sample splices in "Production Test Requirements for Ultimate Butt Splices" specified herein.

The 2 remaining job control sample splice and associated control bar sets, along with the 2 remaining production sample splice and associated control bar sets shall be shipped, unless otherwise directed in writing by the Engineer, to the Transportation Laboratory for quality assurance testing. The 4 sets shall be securely bundled together and identified by location and contract number with weatherproof markings prior to shipment. Bundles containing fewer than 4 sets will not be tested.

Quality assurance testing will be performed in conformance with the requirements for ultimate production sample splices in "Production Test Requirements for Ultimate Butt Splices" specified herein.

Test results for each bundle of 4 sets will be reported in writing to the Contractor within 3 working days after receipt of the bundle by Transportation Laboratory. In the event that more than one bundle is received on the same day, 2 additional working days shall be allowed for providing test results for each additional bundle received. A test report will be made for each bundle received. Should the Contractor elect to encase any splices prior to receiving notification from the Engineer, it is expressly understood that the Contractor will not be relieved of the Contractor's responsibility for incorporating material in the work that conforms to the requirements of the plans and specifications. Any material not conforming to these requirements will be subject to rejection. Should the Contractor elect to wait to encase any splices pending notification by the Engineer, and should the Engineer fail to complete the review and provide notification within this time allowance, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in notification, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

### **MEASUREMENT AND PAYMENT**

Measurement and payment for reinforcement in structures shall conform to the provisions in Section 52-1.10, "Measurement," and Section 52-1.11, "Payment," of the Standard Specifications and these special provisions.

Full compensation for conforming to the provisions of "Ultimate Butt Splices," of these special provisions shall be considered as included in the contract prices paid for the various contract items of work involved and no additional compensation will be allowed therefor.

### **10-1.46 MEMBRANE WATERPROOFING**

This work shall consist of furnishing and placing membrane waterproofing, as shown on the plans, and in conformance with these special provisions.

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications shall be furnished for the preformed membrane sheet. The Certificate of Compliance shall include the following information: (1) type of preformed membrane sheet, and (2) the conditioner or primer application rates.

The preformed membrane waterproofing system shall consist of an adhesive, conditioner or primer applied to a prepared surface; a preformed butyl rubber sheet ; mastic or tape for sealing the edges of the sheet; and a protective covering over the sheet held by an adhesive.

The butyl rubber sheet shall conform to ASTM Designation: D 6134 Type II.

The protective covering shall consist of HDPE sheeting conforming to the provisions in ASTM Designation: D 4801 Type III.

Adhesives, conditioners, primers, mastics and sealing tapes shall be manufactured for use with the respective preformed membrane sheet materials and shall be applied according to the manufacturer's recommendations.

The protective covering shall be 0.76 mm minimum thickness HDPE sheet. Adjacent HDPE sheets shall be lapped a minimum of 150 mm. Backfill material and equipment shall not cut, scratch, depress or cause any other damage to the preformed membrane or the protective covering.

Surfaces designated to receive preformed membrane waterproofing shall be thoroughly cleaned of dirt, dust, loose or unsound concrete, and other extraneous material and shall be free from fins, sharp edges, and protrusions that would, in the opinion of the Engineer, puncture or otherwise damage the membrane. Projections or depressions on the surface on which the membrane is to be applied that may cause injury to the membrane shall be removed or filled as directed by the Engineer. Sharp corners to be covered shall be rounded (outside) or filleted (inside). The minimum size fillet or round shall be 25mm. There shall be no depressions or pockets in horizontal surfaces of the finished waterproofing. Special care shall be taken to make the waterproofing effective along the sides, ends of deck, at joints, and other discontinuities.

Surfaces shall be dry when components of the preformed membrane waterproofing system are applied.

Preformed membrane waterproofing shall not be applied to any surface until the Contractor is prepared to follow its application with the placing of the protective covering and backfill within a sufficiently short time that the membrane will not be damaged by workers or equipment, exposure to weathering, or from any other cause. Damaged membrane or protective covering shall be repaired or replaced by the Contractor at the Contractor's expense.

All projecting pipe, conduits, sleeves or other facilities passing through the preformed membrane waterproofing shall be flashed with prefabricated or field-fabricated boots, fitted coverings or other devices as necessary to provide watertight construction.

All conditioner or primers shall be thoroughly mixed and continuously agitated during application. Conditioner, primers or adhesive shall be allowed to dry to a tack free condition prior to placing membrane sheets.

The surfaces shall be recoated if membrane sheets are not placed over primer, conditioner or adhesive within the time recommended by the manufacturer.

The preformed membrane sheet shall not be applied in wet or foggy weather, nor when the ambient temperature is below 4°C.

Preformed membrane material shall be placed starting at the bottom and lapped by a minimum of 150 mm at splices and at repairs to holes or tears.

Exposed edges of membrane sheets shall have a trowelled bead of manufacturer's recommended mastic or sealing tape applied after the membrane is placed.

The surface of the preformed membrane shall be cleaned free of dirt and other deleterious material before the protective covering is placed.

The protective covering shall be placed on a coating of adhesive of a type recommended by the manufacturer. The adhesive shall be applied at a rate sufficient to hold the protective covering in position until the backfill is placed.

Preformed membrane waterproofing (tunnel) will be measured and paid for by the square meter as shown on the plans.

The contract price paid per square meter for preformed membrane waterproofing (tunnel) shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved in furnishing and installing the membrane waterproofing system, complete in place, as shown on the plans, and as specified in the Standard Specifications and the special provisions, and as directed by the Engineer.

#### **10-1.47 SIGN STRUCTURES**

Sign structures and foundations for overhead signs shall conform to the provisions in Section 56-1, "Overhead Sign Structures," of the Standard Specifications and these special provisions.

Before commencing fabrication of sign structures, the Contractor shall submit 2 sets of working drawings to the Engineer in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The working drawings shall include sign panel dimensions, span lengths, post heights, anchorage layouts, proposed splice locations, a snugging and tensioning pattern for anchor bolts and high strength bolted connections, and details for permanent steel anchor bolt templates. The working drawings shall be supplemented with a written quality control program that includes methods, equipment, and personnel necessary to satisfy the requirements specified herein and in the special provisions.

Working drawings shall be 559 mm x 864 mm or 279 mm x 432 mm in size and each drawing and calculation sheet shall include the State assigned designations for the contract number, sign structure type and reference as shown on the contract plans, District-County-Route-Kilometer Post, and contract number.

The Engineer shall have 20 working days to review the sign structure working drawings after a complete submittal has been received. No fabrication or installation of sign structures shall be performed until the working drawings are approved in writing by the Engineer.

Should the Engineer fail to complete the review within the time allowance and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the sign structure working drawings, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

The time to be provided for the Engineer's review and approval of the working drawings for specific structures, or portions thereof, shall be as follows:

Sign Structure Name/No.	Location	Review Time - (Working Days)
DS-210	"S" 10+72, RT, FNBT	7
DS-207	"R7" 6+03, LT, FWBT	7
DS-40	"AM1" 109+45, LT, FWBT	7
DS-26	BRIDGE MOUNTED, FEBT	7

A permanent steel template shall be used to maintain the proper anchor bolt spacing.

One top nut, one leveling nut, and 2 washers shall be provided for the upper threaded portion of each anchor bolt.

Surfaces of base plates which are to come in contact with concrete, grout, or washers and leveling nuts shall be flat to within 3 mm tolerance in 305 mm, and to within 5 mm tolerance overall. Faying surfaces of plates in high-strength bolted connections including flange surfaces of field splices, chord joints, and frame junctures, and contact surfaces of plates used for breakaway slip base assemblies shall be flat to within 2 mm tolerance in 305 mm, and within 3 mm tolerance overall.

Thermally cut holes made in tubular members of sign supports, other than holes in base and flange plates, shall initially be made a minimum of 2 mm undersized, and then be mechanically enlarged by reaming or grinding to the final required size and shape. All edges shall have a surface roughness of not greater than 6.35  $\mu\text{m}$ . Round holes may be drilled to the exact final diameter. No holes shall be made in members unless the holes are shown on the plans or are approved in writing by the Engineer.

Steel members used for overhead sign structures shall receive nondestructive testing (NDT) in conformance with AWS D1.1 and the following:

A.

Weld Location	Weld Type	Minimum Required NDT
Welds for butt joint welds in tubular sections, nontubular sections, and posts	CJP groove weld with backing ring	100% UT or RT
Longitudinal seam welds*	PJP groove weld	25% MT
	CJP groove weld	100% UT or RT
Welds for base plate, flange plate, or end cap to post or mast arm	CJP groove weld	25% UT or RT
	Fillet weld	25% MT
* Longitudinal seam welds shall have 60% minimum penetration, except that within 150 mm of any circumferential weld, longitudinal seam welds shall be CJP groove welds.		

B. A written procedure approved by the Engineer shall be used when performing UT on material less than 8 mm thick. Contoured shoes shall be used when performing UT on round tubular sections under 1270 mm in diameter.

C. When less than 100 percent of a weld is specified for NDT, and if defects are found during this inspection, additional NDT shall be performed. This additional NDT shall be performed on 25 percent of the total weld for all similar welds, as determined by the Engineer, produced for sign structures in the project. If any portion of the additional weld inspected is found defective, 100 percent of all similar welds produced for sign structures in the project, as determined by the Engineer, shall be tested.

Circumferential welds and base plate to post welds may be repaired only one time without written permission from the Engineer.

Full compensation for furnishing anchor bolt templates and for testing of welds shall be considered as included in the contract price paid per kilogram for furnish sign structure and no additional compensation will be allowed therefor.

#### 10-1.48 ROADSIDE SIGNS

Roadside signs shall be installed at the locations shown on the plans or where designated by the Engineer and in

conformance with the provisions in Section 56-2, "Roadside Signs," of the Standard Specifications and these special provisions.

Wood posts shall be pressure treated after fabrication in conformance with the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," of the Standard Specifications with creosote, creosote coal tar solution, creosote petroleum solution (50-50), pentachlorophenol in hydrocarbon solvent, copper naphthenate, ammoniacal copper arsenate, or ammoniacal copper zinc arsenate. In addition to the preservatives listed above, Southern yellow pine may also be pressure treated with chromated copper arsenate. When other than one of the creosote processes is used, blocks shall have a minimum retention of 6.4 kg/m<sup>3</sup>, and need not be incised.

#### **10-1.49 INSTALL SIGN PANEL ON EXISTING FRAME**

Sign panels shall be installed on existing removable sign panel frames, existing mounting beams or new mounting beams at the locations shown on the plans or where designated by the Engineer and in conformance with the provisions in Section 56-1.06, "Sign Panels and Fastening Hardware," of the Standard Specifications and these special provisions.

Existing sign panels, as shown on the plans, shall be removed and disposed of as provided in Section 15, "Existing Highway Facilities," of the Standard Specifications.

Installing sign panels on existing frames will be measured by the square meter and the quantity to be paid for will be the total area, in square meters, of sign panels installed in place.

Existing removable sign panel frames, when replaced with new mounting beams for laminated sign panels, as shown on the plans, shall be removed and disposed of outside of the highway right of way in accordance with the provisions in Section 7-1.13 of the Standard Specifications.

New mounting beams shall be furnished and installed as shown on the plans.

Existing mounting beams shall be relocated as necessary.

The contract price paid per square meter for install sign panel on existing frame shall include full compensation for furnishing all labor, materials (except State-furnished sign panels and mounting bolts), tools, equipment, and incidentals, and for doing all the work involved in installing sign panels on existing frames, complete in place (including removing and disposing of existing sign panels and disposing of existing sign panels and removable sign panel frames, and furnishing and installing new mounting beams and relocating existing mounting beams), as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **10-1.50 CLEAN AND PAINT STRUCTURAL STEEL**

Exposed new metal surfaces, except where galvanized, shall be cleaned and painted in conformance with the provisions in Section 59-2, "Painting Structural Steel," and Section 91, "Paint," of the Standard Specifications and these special provisions.

Prior to performing any painting or paint removal, the Contractor shall submit to the Engineer, in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications, 3 copies of a separate Painting Quality Work Plan (PQWP) for each item of work for which painting or paint removal is to be performed. As a minimum, each PQWP shall include the following:

- A. The name of each Contractor or subcontractor to be used.
- B. One copy each of all current "SSPC: The Society for Protective Coatings" specifications or qualification procedures which are applicable to the painting or paint removal to be performed. These documents shall become the permanent property of the Department.
- C. Proposed methods and equipment to be used for any paint application.

The Engineer shall have 2 weeks to review the PQWP submittal after a complete plan has been received. No painting or paint removal shall be performed until the PQWP for that work is reviewed by the Engineer. Should the Engineer fail to complete the review within this time allowance and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the PQWP, the delay will be considered a right of way delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

#### **CLEANING**

Exposed new metal surfaces shall be dry blast cleaned in conformance with the requirements in Surface Preparation Specification No. 10, "Near White Blast Cleaning," of the "SSPC: The Society for Protective Coatings." Blast cleaning shall leave surfaces with a dense, uniform, angular anchor pattern of not less than 40 µm nor more than 86 µm as measured in conformance with the requirements in ASTM Designation: D 4417.

Mineral and slag abrasives used for blast cleaning steel shall conform to the requirements in Abrasive Specification No. 1, "Mineral and Slag Abrasives," of the "SSPC: The Society for Protective Coatings" and shall not contain hazardous

material. Mineral and slag abrasives shall comply with the requirements for Class A, Grade 2 to 3 as defined therein.

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications and a Material Safety Data Sheet shall be furnished prior to use for each shipment of blast cleaning material for steel.

## **PAINTING**

Blast cleaned surfaces shall receive a single undercoat, and a final coat where specified, consisting of a waterborne inorganic zinc coating conforming to the requirements in AASHTO Designation M 300, Type II, except that: 1) the first 3 sentences of Section 4.7, "Primer Field Performance Requirements," and the entire Section 4.7.1 shall not apply, and 2) zinc dust shall be Type II in conformance with the requirements in ASTM Designation: D 520. The inorganic zinc coating shall be listed on the qualified products list which may be obtained from the Transportation Laboratory.

The color of the final application of inorganic zinc coating shall match Federal Standard 595B No. 36373.

Inorganic zinc coating shall be used within 12 hours of initial mixing.

Application of inorganic zinc coating shall conform to the provisions for applying zinc-rich coating in Section 59-2.13, "Application of Zinc-Rich Primer," of the Standard Specifications.

Inorganic zinc coating shall not be applied when the atmospheric or surface temperature is less than 7°C or more than 29°C, nor when the relative humidity exceeds 85 percent.

The single undercoat of inorganic zinc coating shall be applied to the required dry film thickness in 2 or more applications within 4 hours after blast cleaning.

The total dry film thickness of all applications of the inorganic zinc undercoat, including the surfaces of outside existing members within the grip under bolt heads, nuts and washers, shall be not less than 100 µm nor more than 200 µm, except that the total dry film thickness on each faying (contact) surface of high strength bolted connections shall be between 25 µm and the maximum allowable dry film thickness for Class B coatings as determined by certified testing in conformance with Appendix A of the "Specification for Structural Joints Using ASTM A325 or A490 Bolts" of the Research Council on Structural Connections (RCSC Specification). Unless otherwise stated, all inorganic zinc coatings used on faying surfaces shall meet the slip coefficient requirements for a Class B coating on blast-cleaned steel, as specified in the RCSC Specification. The Contractor shall provide results of certified testing showing the maximum allowable dry film thickness for the Class B coating from the qualifying tests for the coating he has chosen, and shall maintain the coating thickness on actual faying surfaces of the structure at or below this maximum allowable coating thickness.

Areas where mudcracking occurs in the inorganic zinc coating shall be blast cleaned and repainted with inorganic zinc coating to the specified thickness.

Dry spray, or overspray, as defined in the Steel Structures Painting Manual, Volume 1, "Good Painting Practice," of the "SSPC: The Society for Protective Coatings," shall be removed prior to application of subsequent coats or final acceptance. Removal of dry spray shall be by screening or other methods that minimize polishing of the inorganic zinc surface. The dry film thickness of the coating after removal of dry spray shall be in conformance with the provisions for applying the single undercoat, as specified herein.

The inorganic zinc coating shall be tested for adhesion and cure. The locations of the tests will be determined by the Engineer. The sequence of the testing operations shall be determined by the Contractor. The testing for adhesion and cure will be performed no sooner than 72 hours after application of the single undercoat of inorganic zinc coating. At the Contractor's expense, satisfactory access shall be provided to allow the Engineer to determine the location of the tests and to test the inorganic zinc coating cure. The inorganic zinc coating shall pass the following tests:

### **Adhesion**

- The inorganic zinc coating shall have a minimum adhesion to steel of 4 MPa when measured at no more than 6 locations bearing and 6 locations per assembly using a self-aligning adhesion tester in conformance with the requirements in ASTM Designation: D 4541. The Contractor, at the Contractor's expense, shall: (1) verify compliance with the adhesion requirements, (2) furnish test results to the Engineer, and (3) repair the coating after testing.

### **Cure**

- The inorganic zinc coating, when properly cured, shall exhibit a solid, hard, and polished metal surface when firmly scraped with the knurled edge of a quarter. Inorganic zinc coating that is powdery, soft, or does not exhibit a polished metal surface, as determined by the Engineer, shall be repaired by the Contractor, at the Contractor's expense, by blast cleaning and repainting with inorganic zinc coating to the specified thickness.

The final coat of inorganic zinc coating shall be applied after testing for adhesion, testing for cure, and completion of all operations that may damage or discolor the steel surface, including correction of runs, sags, thin and excessively thick areas in the paint film, skips and holidays, dry spray, or areas of non-uniform appearance.

The area to receive the final coat of inorganic zinc coating shall be lightly roughened by abrasive blasting using an abrasive no larger than 600 µm. Abrasive blasting shall remove no more than 15 µm of inorganic zinc. The surface to be lightly roughened shall be free from moisture, dust, grease or deleterious material. The undercoated areas of the under surfaces of bottom flanges shall be protected from abrasive blast cleaning operations.

The final coat of inorganic zinc coating shall be applied to the required dry film thickness in one uniform application within 24 hours after light roughening. The dry film thickness of the final coat shall be not less than 25 µm nor more than 75 µm.

Except at bolted connections, the total dry film thickness of all applications of the single undercoat and final coat of inorganic zinc coating shall be not less than 125 µm nor more than 275 µm.

Finish coats will not be required.

#### **10-1.51 PREPARE AND PAINT ARCHITECTURAL SURFACE (TEXTURED CONCRETE)**

This work shall consist of preparing and painting dry stack stone textured concrete surfaces, where shown on the plans, and in conformance with these special provisions.

##### **Materials**

The paint shall be a light-stable, alkali-resistant, acrylic latex or acrylic latex copolymer emulsion, commercially manufactured for use as an exterior concrete coating. The paint shall conform to the provisions in Section 91-4.05, "Paint: Acrylic Emulsion, Exterior White and Light and Medium Tints," of the Standard Specifications.

##### **Test Panel**

A test panel at least 1.25 m x 1.25 m in size shall be successfully completed at a location approved by the Engineer before beginning work on architectural texture or painting textured concrete. The test panel shall be constructed, finished, and painted with the materials, tools, equipment, personnel, and methods to be used in constructing, finishing, and painting the concrete surfaces. A total of three colors shall be used. One color as a base coat and two blended accent colors. Selected colors that compliment the existing natural earth and rock indigenous warm colors. If ordered by the Engineer, additional test panels shall be constructed and finished until the specified finish, texture, and color are obtained, as determined by the Engineer.

The test panel approved by the Engineer shall be used as the standard for comparison in determining acceptability of architectural texture and painting for concrete surfaces.

The Contractor shall submit to the Engineer, not less than one week prior to initial application of the concrete coating to the test panel, a copy of the manufacturer's recommendations and written application instructions.

##### **Surface Preparation**

New concrete surfaces to be painted shall be cured in conformance with the provisions in Section 90-7.03, "Curing Structures," of the Standard Specifications.

Concrete surfaces to be painted shall be prepared in conformance with the requirements of SSPC-SP 13, "Surface Preparation of Concrete," of the SSPC: The Society for Protective Coatings". After concrete surface preparation is complete, the Contractor shall clean all concrete surfaces to be painted by water rinsing as defined in Section 59-1.03, "Application," of the Standard Specifications.

##### **Painting Concrete**

The coating shall be applied per the manufacturer's recommendations and in conformance with the requirements of SSPC-Guide 11, "Guide for Coating Concrete," of the "SSPC: The Society for Protective Coatings".

Any damaged areas shall be repaired in the same manner as the original surface preparation and paint application.

##### **Measurement and Payment**

Full compensation for preparing and painting textured concrete surfaces shall be considered as included in the contract price paid per square meter for architectural texture of the types listed in the Engineer's Estimate and no separate payment will be made therefor.

#### **10-1.52 PREPARING AND PAINTING CONCRETE (TUNNEL)**

The concrete walls, ceilings, and other portions as shown on the plans of the NB Sunrise Underpass Tunnel shall be prepared and painted in conformance with the details shown on the plans, the provisions in Section 59, "Painting," and

Section 91 "Paint," of the Standard Specifications, and these special provisions.

The coating system shall consist of an epoxy primer and a 100% solids polyurea coating. The epoxy primer shall be as recommended by the manufacturer of the selected polyurea coating for use on concrete and contain no volatile solvents. A polyurea coating is defined as the reaction product between an isocyanate and an amine terminated polymer resin. The polyurea coating shall have the following properties:

Property	Requirement
Elongation (ASTM Designation: D 412)	Minimum 300%
Tensile Strength (ASTM Designation: D 412)	17 Mpa
Surface Hardness (ASTM Designation: D2240, Shore A)	90 to 98
Abrasion Loss (Taber. 1 Kg. H-18 wheel)	Maximum 200 mg
Water Absorption (ASTM Designation: D471)	Maximum 1% @ 24 hours

The coating system shall have the following properties:

Property	Requirement
Adhesion to Concrete (ASTM Designation: D 4541)	Minimum 2 MPa
Dry Film Thickness (ASTM Designation: D6132)	Minimum 1.6 mm
Color Stability (ASTM Designation: D2565)	No visible color change after 500 hours

All components of the coating system shall be supplied by the same manufacturer. The coating system shall be continuous and free from visible pinholes and holidays.

Concrete coatings shall be used in conformance with the manufacturer's written recommendations and these special provisions.

Each shipment of concrete coating shall be accompanied by the manufacturer's recommendations for the application of the coating and a Certificate of Compliance conforming to Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

The coating shall be applied to the concrete at least 30 days after the last concrete has been placed. At least 48 hours prior to application of the coating, the entire concrete surface shall be abrasive blast cleaned. Cleaning shall remove all dirt, debris and other deleterious materials including removal of the existing cement matrix sufficient to expose the fine aggregates with minimal exposure of the coarse aggregates. Holes with a minimum dimension of 3 mm, as recommended by the coating manufacturer, shall be filled with epoxy mortar. Cracks greater than 0.25 mm and less than 0.76 mm shall be repaired with epoxy mortar prior to coating. Cracks greater than 0.76 mm shall be repaired in conformance with the manufacturer's recommendations.

Surface preparation and all coating operations shall be in accordance with the requirements of the National Association of Corrosion Engineer, RP 0892 unless otherwise superceded by these special provisions of the coating manufacturers written requirements.

The color of the concrete coating shall match the color of Federal Standard 595B, No. 27925. The concrete surface shall be dry when coating is applied. The polyurea component of the concrete coating system shall be applied in one continuous application to a minimum dry film thickness of 1.6 mm.

The concrete epoxy primer and polyurea component coating materials shall be applied under controlled ventilation conditions as per manufacturer's recommendations.

The Contractor shall arrange for a manufacturer's technical representative to be on site to advise and instruct the Contractor and the Engineer on the manufacturer's recommended installation practices and procedures for the duration of the coating operation.

The contract lump sum price paid for preparing and painting concrete (tunnel) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in preparing and painting concrete (tunnel), complete in place, including the services of the manufacturer's technical representative, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **10-1.53 ALTERNATIVE PIPE**

Alternative pipe culverts shall conform to the provisions in Section 62, "Alternative Culverts," of the Standard Specifications and these special provisions.

Existing culverts, where shown on the plans to be extended, shall be extended with new culvert pipe of the same type of material as the existing culvert. Pipe used to extend the existing culverts will be measured and paid for as alternative pipe culvert of the various sizes and types of pipe involved.



## **SPIRAL RIB PIPE**

Spiral rib pipe shall conform to the provisions in "Corrugated Metal Pipe" of these special provisions, except for profile and fabrication requirements.

Spiral rib pipe shall, at the option of the Contractor, consist of either (1) three rectangular ribs spaced midway between seams with ribs 19 mm wide by 19 mm high at a maximum rib pitch of 191 mm, (2) two rectangular ribs and one half-circle rib equally spaced between seams with ribs 19 mm wide by 25 mm high at a maximum rib pitch of 292 mm. The half-circle rib diameter shall be spaced midway between the rectangular ribs or (3) two rectangular ribs equally spaced between seams with ribs 19 mm wide by 25 mm high at a maximum rib pitch of 213 mm. Rib pitch measured at right angles to the direction of the ribs may vary  $\pm 13$  mm.

Corrugated steel spiral rib pipe shall be fabricated by a continuous helical lock seam fabricated in conformance with the provisions in Section 66-3.03C(1), "Fabrication by Continuous Lock Seam," of the Standard Specifications.

Coupling bands for spiral rib pipe shall conform to the provisions in Section 66-1.07, "Coupling Bands," of the Standard Specifications. A coupling band shown on the plans or approved by the Engineer in conformance with the provisions in Section 61-1.02, "Performance Requirements for Culvert and Drainage Pipe Joints," of the Standard Specifications, for use on a pipe corrugation of 68 mm x 13 mm for corrugated metal pipe may be used on spiral rib pipe having 68 mm x 13 mm rolerolled annular ends. The width of band (W) for hat bands for pipe sizes larger than 1200 mm in diameter shall be 95 mm.

## **10-1.54 PLASTIC PIPE**

Plastic pipe shall conform to the provisions in Section 64, "Plastic Pipe," of the Standard Specifications.

## **10-1.55 REINFORCED CONCRETE PIPE**

Reinforced concrete pipe shall conform to the provisions in Section 65, "Reinforced Concrete Pipe," of the Standard Specifications and these special provisions.

Where embankment will not be placed over the top of the pipe, a relative compaction of not less than 85 percent shall be required below the pipe spring line for pipe installed using Method 1 backfill in trench, as shown on Standard Plan A62D. Where the pipe is to be placed under the traveled way, a relative compaction of not less than 90 percent shall be required unless the minimum distance between the top of the pipe and the pavement surface is the greater of 1.2 m or one half of the outside diameter of the pipe.

Except as otherwise designated by classification on the plans or in the specifications, joints for culvert and drainage pipes shall conform to the plans or specifications for standard joints.

When reinforced concrete pipe is installed in conformance with the details shown on Revised Standard Plan A62DA, the fifth paragraph of Section 19-3.04, "Water Control and Foundation Treatment," of the Standard Specifications shall not apply.

When solid rock or other unyielding material is encountered at the planned elevation of the bottom of the bedding, the material below the bottom of the bedding shall be removed to a depth of 1/50 of the height of the embankment over the top of the culvert, but not less than 150 mm nor more than 300 mm. The resulting trench below the bottom of the bedding shall be backfilled with structure backfill material in conformance with the provisions in Section 19-3.06, "Structure Backfill," of the Standard Specifications.

The excavation and backfill below the planned elevation of the bottom of the bedding will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

The Outer Bedding shown on Revised Standard Plan A62DA shall not be compacted prior to placement of the pipe.

## **10-1.56 CORRUGATED METAL PIPE**

Corrugated steel culverts shall conform to the provisions in Section 66, "Corrugated Metal Pipe," of the Standard Specifications.

## **10-1.57 UNDERDRAIN**

Intermediate crossdrains shall conform to the provisions in Section 68-1, "Underdrains," of the Standard Specifications.

## **10-1.58 OVERSIDE DRAIN**

Asphalt concrete overside drains shall conform to the provisions in Section 69, "Overside Drains," of the Standard Specifications.

## **10-1.59 MISCELLANEOUS FACILITIES**

Flared end sections and drainage manholes shall conform to the provisions in Section 70, "Miscellaneous Facilities," of the Standard Specifications and these special provisions.

Drainage manhole riser rings, cones and adjustment rings shall conform to ASTM Designation C-478.

Drainage manhole frames and covers shall conform to provisions in Section 75, "Miscellaneous Metal," of the Standard Specifications.

Concrete for drainage manhole base and paving ring at cover shall conform to provisions in Section 90-10, "Minor Concrete," of the Standard Specifications.

The quantity of drainage manholes will be determined as units from actual count.

The contract unit price paid for drainage manholes shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing drainage manholes complete in place, including portland cement concrete, and structure excavation and structure backfill, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **10-1.60 SLOPE PROTECTION**

Slope protection shall be placed or constructed in conformance with the provisions in Section 72, "Slope Protection," of the Standard Specifications and these special provisions.

Rock slope protection fabric shall be woven or nonwoven type fabric, Type A, at the option of the Contractor.

#### **10-1.61 MISCELLANEOUS CONCRETE CONSTRUCTION**

Concrete curb, sidewalks, and curb ramps shall conform to the provisions in Section 73, "Concrete Curbs and Sidewalks," of the Standard Specifications and these special provisions.

Curb ramp detectable warning surface shall conform to the details shown on the plans and shall not be constructed or installed on curb ramps with a slope that exceeds 6.67 percent. The finished surfaces of the detectable warning surface shall be free from blemishes.

Curb ramp detectable warning surface shall consist of raised truncated domes constructed or installed on curb ramps. Detectable warning surface, at the option of the Contractor, shall be either cast-in-place or stamped into the surface of the curb ramp, or shall be a prefabricated surface installed on the curb ramp. The color of the detectable warning surface shall be yellow conforming to Federal Standard No. 595B, Color No. 33538. Detectable warning surface, either cast-in-place or stamped into the surface of the curb ramp, shall be painted yellow in conformance with the provisions in Section 59-6, "Painting Concrete," of the Standard Specifications.

Prior to constructing curb ramps with a cast-in-place or stamped detectable warning surface, a test panel shall be constructed on the project site and shall be of a size not less than 600 mm by 600 mm. The test panel shall be constructed, finished and cured with the same materials, tools, equipment, and methods to be used in constructing the proposed permanent work. Additional test panels shall be constructed as necessary until a panel is produced which demonstrates, to the satisfaction of the Engineer, the ability of the selected procedure to produce a detectable warning surface that meets all of the specified requirements. Compensation for constructing or installing a curb ramp detectable warning surface shall be considered as included in the contract price paid per cubic meter for minor concrete (miscellaneous construction) and no separate payment will be made therefor.

#### **10-1.62 MINOR CONCRETE (STAMPED CONCRETE)**

Minor Concrete (Stamped Concrete) shall be constructed of minor concrete conforming to the provisions in Section 90-10, "Minor Concrete," of the Standard Specifications and these special provisions.

Aggregate for minor concrete (stamped concrete) shall conform to the grading specified for fine aggregate in Section 90-3.03, "Fine Aggregate Grading," of the Standard Specifications.

The stamped concrete shall have a color matching Federal color No 30108, of the 595B Federal Color Chart Coloring shall be integral, chemically inert, fade resistant mineral oxide or synthetic type.

The stamped concrete shall have a release agent color conforming to Federal Standard 595B Color No. 30340.

Samples of the colors specified for stamped concrete are available for review at most standard paint retailers and through the following internet address (<http://www.gardco.com/navigation.html>) Portland cement concrete closely conforming to the colors specified for stamped concrete are available through commercial concrete sources.

A test panel at least 1.25 m x 1.25 m in size, of stamped concrete and color of the stamped concrete, shall be successfully completed at a location approved by the Engineer to demonstrate the stamped surface, including color hardener, curing and finishing compounds, shall be submitted to the Engineer for written approval.

Test panels when no longer required as determined by the Engineer shall be removed and disposed of outside the

highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Stamped concrete shall not be placed on the project prior to approval by the Engineer of the test panel prepared and submitted by the Contractor.

Aggregate base shall be Class 2 and shall conform to the provisions in Section 26, "Aggregate Bases," of the Standard Specifications.

The respective pattern types and colors of concrete for stamped concrete shall be placed at the locations shown on the plans, struck off and compacted until a layer of mortar is brought to the surface. The concrete shall be screeded to the required grade and cross section and floated to a uniform surface.

Color hardener shall be applied to the plastic surface of the concrete by the "dry-shake" method using a minimum of 30 kg of hardener per 10 m<sup>2</sup>. Hardener shall be applied in 2 applications, shall be wood-floated after each application, and shall be trowelled only after the final floating. The resultant color of the hardener shall closely conform to the colors specified on the plans for the respective areas.

The forming tools for the stamped concrete shall be applied to form the patterned surfaces while the concrete is still in the plastic stage of set.

Stamped concrete areas shall be cured by the curing compound method. The curing compound shall be curing compound (6) conforming to the provisions in Section 90-7.01B, "Curing Compound Method," of the Standard Specifications.

For payment purposes, the area in square meters of minor concrete (stamped concrete) will be determined from horizontal measurements of the finished stamped concrete.

The contract price paid per square meter for minor concrete (stamped concrete) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing minor concrete (stamped concrete), including aggregate base beneath the stamped concrete, saw cutting, removal and disposal of asphalt concrete surfacing where required, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **10-1.63 DRAINAGE PUMPING EQUIPMENT**

##### **GENERAL**

The work shall consist of furnishing and installing pumping plant equipment in accordance with these special provisions, the details shown on the plans and the provisions in Section 74, "Pumping Plant Equipment," of the Standard Specifications and these special provisions.

Earthwork, foundations, sheet metal, electrical, and all other work incidental and necessary to the proper installation and operation of the mechanical work shall conform to the requirements for similar type work elsewhere in these special provisions.

All electrical components of mechanical work and their installation shall conform to the National Electrical Code; the California Administrative Codes, Title 24, Part 3, "Basic Electrical Regulations," and Title 8, Chapter 4, "Electrical Safety Orders".

Certification required for drainage pumps shall be delivered to the Engineer in triplicate before pump installation.

##### **SUBMITTALS**

Submittals shall be as specified in Section 74-1.04, "Data To Be Furnished," of the Standard Specifications. In addition, submittals shall include the following information:

1. Descriptive Data.--Five (5) bound identified copies of the complete description and performance data covering materials and equipment specified herein shall be submitted for approval. Submittals shall be approved prior to installation and shall include, but not necessarily be limited to, the following:

- Drainage pump, including motor and pump base
- Flexible expansion coupling
- Wall louver
- Flap valve
- Pressure gage and Gage cock
- Pumphouse door

2. Manuals.--Before completion of project, 3 bound identified copies of operation and maintenance instructions and

parts lists for equipment furnished shall be delivered to the Engineer at the jobsite. Manuals that are inadequate or incomplete will be returned and the Contractor shall resubmit adequate and complete manuals. Manuals shall be included for the following equipment:

3. Warranties and Guarantees.--Manufacturer's warranties and guarantees furnished for materials or equipment used in the work shall be delivered to the Engineer at the jobsite prior to acceptance of the contract.

## **PUMP EQUIPMENT**

### **Drainage Pump.--**

Drainage pump shall be a submersible type, close coupled, submersible motor wastewater pump. Pump casing, bracket, and volute shall be gray cast iron construction. All external nuts and bolts shall be non-magnetic stainless steel. Provide pumps with characteristics meeting the following conditions:

Design Operating Condition:

Capacity, gpm/liters per minute	1170/4420
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Total Dynamic Head, feet of water/meters of water	47/14.3
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2<sup>nd</sup> Operating Condition:

Capacity, gpm/liter per minute	930/3530
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Total Dynamic Head, feet of water/meter of water	51/15.5, min.
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3<sup>rd</sup> Operating Condition:

Capacity, gpm/liter per minute	1400/5300
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Total Dynamic Head, feet of water/meter of water	38,11.6 min.
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Pump Speed, rpm	1750
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Power, kW	22.4 max.
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Power supply	3-phase/480 volts
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### **Pump and Motor Construction.--**

1. General: The pump and motor package shall be suitable for Class 1, Division 2 location (explosion proof classification not required).
2. Casing: Cast iron, ASTM A48 Class 30, with 6" horizontal discharge. Volute shall provide for unobstructed flow for any solids that can be passed by the impeller. A brass or nitrile rubber coated steel wear ring insert shall be provided on the volute inlet.
3. Impeller: Single-piece casting of ductile iron or bronze. Impeller shall be non-clogging design and shall be dynamically balanced. The design of the impeller shall be such that rags and similar materials will not clog the pump, and capable of passing 76 mm solids, sludge and fibrous materials. The impeller shall be dynamically balanced and factory certified in accordance with ISO Grade 6.3 for rotors in rigid frames at the RPM of the motor supplied. Balance certificate shall be submitted as part of the certified pump curve performance submittal. Balancing of impeller shall not weaken or deform the impeller. The arrangement shall be such that the impeller cannot be loosened by torque from either forward or reverse rotation. The drainage pump shall include replaceable bronze impeller wear rings and casing wear rings.
4. Bearings: The pump shaft shall be supported by two ball bearings arranged for permanent grease lubrication. Bearing shall be designed in accordance with the Anti-Friction Bearing Manufacturers Association, Inc. Standards Class M2, L-10 rating life of 80,000 hours.

Prelubricated anti-friction bearings shall be protected in accordance with the bearing manufacturer's

recommendations against the formation of rust during a period of storage while awaiting the completion of installation and startup.

5. **Mechanical Seals:** The pump motor shall be a 3-phase NEMA Design B, oil filled or continuous duty in air, induction motor. Motor shall be housed in a cast iron casing and shall have moisture resistant NEMA Class F insulation. Motor size, voltage, and rpm shall be as shown on the plans. The pump motor shall be a standard efficiency motor and sized NEMA Code G or smaller.
6. **Hardware:** All nuts and bolts shall be Type 304 or 316 stainless steel.
7. **Motor:** The pump motor shall be protected from contamination by the liquid being pumped, by a tandem, double-mechanical seal running in an oil reservoir. The oil reservoir of the pump shall be equipped with a seal failure alarm system. Seals shall be tungsten carbide or silicone carbide. Motor shall be capable of at least 10 starts per hour.
8. **Pump cords:** The pump motor shall have portable Type SO cord, or cords, approved for extra hard service, of sufficient length to reach from the pump to the junction box, as shown on the plans, without splicing. Cords shall have suitable cable connectors for terminating in a junction box and contain an equipment grounding conductor with green or green with yellow stripe insulation. Cords shall be sealed into the motor with epoxy by the pump manufacturer, and provided with strain relief features at the junction box.

#### **Pump Protection.--**

1. **Thermal switches:** Each motor stator shall incorporate thermal switches in series to monitor the temperature of each phase winding. The switches shall be set to open at 260°F, stop the motor, and activate an alarm.
2. **Leakage Sensor:** A leakage sensor shall be provided on each pump to detect the presence of water in the motor stator chamber. When activated, the leakage sensor shall stop the motor and activate an alarm.
3. **Monitoring unit:** The thermal switches and FLS shall be connected to a Control and Status monitoring unit, which shall be mounted in the control panel and integrated into the system controls.

#### **Pump Station Accessories And Appurtenances.--**

1. **Wet well access door:** Provide and install an aluminum access door on the wet well as shown on the Plans, sized to accommodate the specified submersible pumps. The manufacturer shall guarantee against defects in material or workmanship for a minimum of five years.
  - A. Access door shall be single-leaf type with clear inside opening of 1219.2 mm (48 inches) by 2133.6 mm (84 inches). Door leaf shall be 1/4" aluminum diamond pattern plate fabricated to withstand 14,400 Pa (300 P.S.F.) loading. Channel frame shall be 1/4" structural grade aluminum. Exterior of frame shall have mill finish with bituminous coating applied prior to embedment.
  - B. Door shall be equipped with heavy-duty stainless steel hinges, stainless steel pins, compression spring operator for ease of operation, and an automatic hold-open arm with release handle. The door shall be provided with a slam lock with removable handle, and a covered recessed padlock mechanism. Padlock will be furnished by others after acceptance of pump station.
2. Provide and install a stainless steel lifting chain sized per the pump manufacturer's recommendation.
3. Provide and install anchor bolts, Type 316 stainless steel, in accordance with the pump manufacturer's recommendations.
4. Gravity inlet passing through the wet well walls shall be sealed using a mechanical seal.
5. The drainage pump shall be foot mounted, with the discharge pipe bolted directly to the pump discharge flange. The foot mounted base shall be specifically designed by the pump manufacturer to allow proper operation of the pump at the pumping conditions specified and shall be designed to support the assembled weight of the pump and

motor.

Two submittals shall be submitted for approval. The first submittal shall be the pump manufacturer's standard or representative performance data for the pump being proposed. It shall show that the pump meets the specified performance points and does not develop more than 95% of the motor nameplate power, anywhere on the pumping curve.

The second submittal shall be the pump manufacturer's factory certified test data for each approved pump. Each pump supplied shall be factory tested as an assembled pumping unit, and certified capable of pumping water under test according to the flow rates at the total heads indicated on the plans. Testing shall be done in accordance with the Hydraulics Institute, Centrifugal Pump Test Standard. The certified test shall show that the pump does not develop more than 100% of the motor nameplate power, anywhere on the pumping curve. The pumping unit shall be defined as the actual driver, and actual pump and impeller combination supplied.

Documentation of the factory certified test shall include:

- a record of the actual test points used to generate the pump curve.
- a pump performance curve showing flow rate versus total dynamic head.
- the points specified in the contract documents plotted on the submitted curve.
- the power and efficiency curves from shut off head down to 10 meters.
- the rpm of the actual driver.
- the actual impeller diameter.

The pump and motor shall be shipped in a condition capable of being in storage before final installation. If the Contractor elects to store the drainage pumping equipment before final installation, the Contractor shall maintain the pump in accordance with the manufacturer's recommended storage and warranty requirements.

The complete pump and motor assembly shall be factory coated with an approved manufacturer recommended coating system compatible with the intended application of the drainage pumping equipment.

**Flap Valve.**--Flap valve shall be the type and size shown on the plans and shall be iron body with bronze mating surfaces and pipe flange frames. Flap valve shall have stop to limit opening to no closer than 10 degrees from vertical.

**Fasteners.**--All fasteners, including expansion anchors, nuts, bolts and washers, shall be stainless steel unless otherwise noted.

**Pumphouse Door.**--The pumphouse door shall be a 915-mm x 2130 mm x 44-mm flush type, vertically stiffened, hollow metal door, and metal frame. The door shall be formed of 1.5-mm nominal thickness, galvanized face sheets, turned over and fully covering all vertical edges. Seams shall be continuously welded. The door shall have 1.5-mm nominal thickness, or thicker, steel stiffener channels along hinge and lock edges. End channels (top and bottom) shall be fully flush and continuously closed. The door shall have continuous one piece, full length, vertical steel rib stiffeners spaced not to exceed 150 mm apart, with insulation between. The door shall also be reinforced around the hinges and lockset. The bottom end shall have moisture vents to drain condensation. The door and frame shall be factory prepared and reinforced to receive hardware. All parts of the door shall be securely welded together. Exterior welds shall be ground flush.

The door frame shall be formed of 1.2 mm nominal thickness, pressed sheet steel 140 mm x 50 mm in section with mitered, full welded corners and at least 3 standard casting anchors on each side supplied by manufacturer. The frame shall have adequate metal housing closures at hinges and latch to prevent intrusion of concrete or grout. Exterior welds shall be ground flush. The threshold shall be the rectangular or half saddle, bumper type for outswing doors, and securely anchored to the floor.

Pumphouse door hardware shall consist of the following: Hinges shall be 1 1/2 pair, non-removable pins, full mortise butt hinges. Hinges shall be industrial, heavy weight quality, stainless steel or brass, 5 knuckle, concealed ball bearing. Latch shall be non-locking, knob type passage latch, brass or stainless steel, heavy duty, corrosion resistant, and designed in accordance with ANSI A 156.2, Grade 1. The door lock cover shall be fabricated and installed as shown on the plans and as directed by the Engineer. Padlock will be furnished by others after acceptance of pumphouse.

The doorframe shall be set true and plumb and shall be adequately braced to prevent distortion when the concrete is placed. All doors shall fit correctly in their frames, shall swing freely and shall close properly.

The hollow metal door and frame shall be factory painted with an approved coating suitable for exterior applications.

The door shall be installed with a doorstop and latch that can hold the door open.

If the Contractor desires to lock the pumphouse during construction, he shall furnish his own lock for the door until acceptance of the pumphouse.

**Wall Louver.**--Wall louver shall have V shaped blades and shall be constructed of 1.3-mm electro-galvanized steel. Wall louver shall be set in a continuous channel frame, in accordance with manufacturer's recommendations, with a insect

and bird-screen in a removable frame from the inside face. Surfaces shall be finish painted in the field, after installation, or shall be factory finish painted. Wall louver shall be Anemostat; K.N. Croder Inc.; Leslie Locke, or equal.

**Pressure Gage.**—Pressure gage shall be ANSI Standard: Grade A, 114 millimeter dial, liquid filled with cover, stainless steel case, reset screw, 6 millimeter MPT bottom inlet. Gage shall be dual scale KPa and PSIG, from 0 KPa to 200 KPa. A second gage provided shall be dual scale KPa and PSIG, from 0 KPa to 80 KPa. Gage cock shall be 6-millimeter NPT ball valve. Pressure gage shall be Marsh, Ashcroft, or equal.

**Dimensions and Locations.**--Dimensions and locations of pumping equipment shown on the plans are approximate. Contractor shall submit detailed drawings showing installation details of pumps and associated hardware. If pumps selected by the Contractor require revisions to pump plant metal work or other construction details, the Contractor shall submit detailed drawings of these revisions for approval. No additional compensation shall be made for revisions resulting from Contractor's pump selection.

**Identification.**--Pipe shall be painted on the upper discharge elbow with a number to correspond to the connected pump assembly.

**Scale.**--The lowest ladder shall have a scale on the exposed side graduated every two centimeters. The marking shall be numbered every 10 centimeters. The "zero" point for the start of the marking shall be the floor of the pumping plant.

## **10-1.64 PUMPING PLANT ELECTRICAL EQUIPMENT**

### **GENERAL**

Work covered by this section shall include furnishing all labor, materials, equipment and services required to construct and install the complete electrical system, including earthwork, removal, relocation and salvaging of material or equipment in accordance with the details shown on the plans, the provisions of Section 74, "Pumping Plant Equipment" and Section 86, "Signals, Lighting and Electrical Systems" of the Standard Specifications and as specified in this section, and the work of installing and wiring motors as specified under "Pumping Plant Equipment" of these special provisions.

Earthwork, foundations, sheet metal, painting, mechanical and such other work incidental to and necessary for the proper installation and operation of the electrical work shall be done in accordance with the requirements specified for similar work elsewhere in these special provisions or in the Standard Specifications.

### **SUBMITTALS**

Submittals shall be as specified in section 74-1.04 "Data to be Furnished" of the Standard Specifications. All dimensions illustrated on submittal drawings and all units of measurement shall be shown in the International System of Units (metric system).

**Operation and Maintenance Manuals.**-- Prior to the completion of the contract, four (4) bound identified copies of the operation and maintenance instructions with parts lists for the equipment specified herein shall be delivered to the Engineer at the jobsite. The instructions and parts lists shall be in a bound manual form and shall be complete and adequate for the equipment installed. Inadequate or incomplete material will be returned. The Contractor shall resubmit adequate and complete manuals at no expense to the State.

Manuals shall be submitted for the following equipment:

Light Fixtures.

**Warranties, guaranties, and instruction sheets** -- Manufacturer's warranties and guaranties furnished for materials used in the work and instruction sheets and parts lists supplied with materials shall be delivered to the Engineer prior to acceptance of the project.

### **QUALITY ASSURANCE**

**Testing** -- After the electrical system installation work has been completed, the electrical system shall be tested in the presence of the Engineer to demonstrate that the electrical system functions properly. The Contractor shall make necessary repairs, replacements, adjustments and retests at his expense.

**Field testing** -- Prior to start of functional testing, the Contractor shall perform the following tests on all circuits, in the presence of the Engineer.

**Continuity** -- Each circuit shall be tested for continuity.

**Ground** -- Each circuit shall be tested for grounds.

**Insulation Resistance** -- An insulation resistance test at 500 V DC shall be made on each circuit between the circuit and a ground. The insulation resistance shall not be less than 10 MΩ on all circuits.

**Ground Resistance Testing** -- Each ground system installed will be tested with a ground resistance tester and the results turned over to the Engineer.

## **MATERIALS**

**Conduit** -- Conduit shall conform to Section 86-2.05 "Conduit" in the Standard Specifications and as specified in these special provisions. Unless otherwise shown on the plans, all conduit shall be threaded, hot-dip galvanized inside and outside, rigid steel conduit with threaded steel or malleable iron fittings.

**Conductors** -- Conductors shall conform to Section 86-2.08 "Conductors" in the Standard Specifications and as specified in these special provisions.

Conductors shall be stranded copper, type THHN in dry locations and XHHW in wet locations.

**Power distribution blocks (PDB)** -- 150-ampere, 600-volt, NEMA rated, 3-pole phenolic plastic blocks with mounting holes. PDB shall be rated for copper wire only and be UL listed. The phenolic plastic shall have a high resistance to heat, moisture, mechanical shock and electric potential and shall have a smooth even finish.

**Room light (RL)** -- Surface mounted fluorescent fixture with two F48T12SPEC30 lamp and -20°C ballast. Fixture housing and reflector shall be copper-free aluminum. Lens shall be explosion-proof, impact- and heat-resistant glass tubes. Fixture shall be suitable for wet and Class 1 Division 2 locations. Fixture shall be Appleton type EFU Catalog No. ARS240-118ESB; or equal.

**Sump light (SL)** -- Weatherproof, one-piece aluminum housing with polyester finish. Thermal-shock and impact resistant glass lens. Fixture shall have integral ballast and 120-volt, 400-watt metal halide lamp. The fixture shall be suitable for wet and Class 1 Division 2 locations. The sump lights shall be installed as shown on the plans. Fixture shall be Appleton type Areamaster 250/400; or equal

**Entry light (EL)** -- Outdoor, wall mounted, 35-watt, 120-volt high pressure sodium cut-off type luminaire with integral ballast and photocell. The luminaire shall be Lithonia type TWAC; Thomas Industries Day-Brite type Directolite Wall Light; or equal.

**Light switch** -- 20-ampere, 120/277-volt AC, specification grade switch suitable for wiring with stranded conductors in a malleable iron box and cover. Switch shall be suitable for wet and Class 1 Division 2 locations. Switch shall be Appleton type EDS Factory Sealed Tumbler Switches; or equal.

**Plug receptacle (PR)** -- Plug receptacle shall be 20-ampere, 3-wire, 125-volt, grounding type, specification grade, with ground fault interruption suitable for wiring with stranded conductors in a cast metal box. Receptacle shall detect and trip at current leakage of 5 milliamperes and shall have front mounted test and reset buttons. Plug receptacle shall be suitable for wet and Class 1 Division 2 locations. Receptacle shall be Appleton type EFSR-GFI Factory Sealed; or equal.

**Door switch** -- Magnetic door switch shall consist of two-section, high security, magnetically balanced type, long life reed switch. Switch cannot be defeated by an externally applied magnet and shall be compatible with the material of the door at the pump house. Magnetic door switch shall be provided with a connector for 16mm conduit. Door switch shall be suitable for wet and Class 1 Division 2 locations.

**Junction and outlet boxes** -- All boxes shall be PVC coated cast ferrous metal box with hubs and gasketed cover.

**Wet pit junction box** -- Wet pit junction box shall be a NEMA 4x with a mounting plate, terminal blocks and a hinged



gasketed cover as shown on the plans.

**Underground pull boxes** -- Concrete type and shall be as shown on sheet ES-8 of the Standard Plans.

**Pull ropes** -- Pull ropes shall be nylon or polypropylene with a minimum tensile strength of 225 kg.

**Nameplates** -- Nameplates shall be laminated phenolic plastic with white core and black front and back. Nameplate inscription shall be in capital letters etched through the outer layer of the nameplate material.

**Warning plates** -- Warning plates shall be laminated phenolic plastic with white core and red front and back. Unless otherwise shown on the plans, warning plate inscription shall be in 6-mm high capital letters etched through the outer layer of the warning plate material.

## EXECUTION

**General** -- In addition to the requirements of Section 74, "Pumping Plant Equipment" of the Standard Specifications, the execution of the work shall conform to the following requirements:

**Conduits** -- Do not install any conduits behind ladders or within 380 mm of the center line of the ladder.

**Conductors** -- Feeder and branch circuit ungrounded conductors shall be color coded by continuously colored insulation, except conductors No. 6 AWG or larger may be color coded by colored tape at each connection and where accessible. Ungrounded conductor color coding shall be as follows:

SYSTEM	COLOR CODE
120/240V-Single phase	Black, blue
120/240V-Three phase	Black, orange, blue
480/277V-Three phase	Brown, orange, yellow

**Component mounting** -- Components shall be mounted where shown on the plans.

**Pull boxes** -- Pull boxes shall be installed as specified in Section 86-2.06C "Installation and Use" of the Standard Specifications.

**Nameplates** -- Inscriptions on nameplates shall be as shown on the plans. Nameplates shall be mounted with self-tapping cadmium plated screws or nickel plated bolts except the nameplates mounted on the back of an enclosure cover shall be attached with a strong adhesive.

**Supporting devices** -- Hangers, brackets, supports, and electrical equipment shall be secured to surfaces by means of expansion shields and machine screws or standard preset inserts on concrete or solid masonry; machine screws or bolts on metal surfaces; and wood screws on wood construction.

Supporting devices shall be corrosion resistant.

### 10-1.65 MISCELLANEOUS IRON AND STEEL

Miscellaneous iron and steel shall conform to the provisions in Section 75, "Miscellaneous Metal," of the Standard Specifications.

### 10-1.66 MISCELLANEOUS METAL (BRIDGE)

Miscellaneous metal (bridge) shall conform to the provisions for miscellaneous bridge metal in Section 75, "Miscellaneous Metal," of the Standard Specifications and these special provisions.

Attention is directed to "Welding" of these special provisions.

Miscellaneous metal (bridge) shall consist of the miscellaneous bridge metal items listed in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications, and the following:

- A. Pipe hanger, rods, nuts, lock washers associated with Pipe Hanger Detail
- B. Expansion Coupling used in deck drainage piping.

Self-tapping screws used for sleeve connections shall be hex-head stainless steel, installed in holes drilled to fit the self-tapping screws, conforming to the requirements of ASTM Designation: A 276, Type 304.

At the Contractor's option, fiberglass pipes and fittings with the same diameter and minimum bend radius as those shown on the plans, may be substituted for welded steel pipe in deck drain systems.

Fiberglass pipe and fittings shall conform to the requirements in ASTM Designation: D 2996, and shall have a minimum short-term rupture strength of 207 MPa. The adhesive type recommended by the manufacturer shall be used for joining pipe and fittings. Fiberglass pipe not enclosed in a box girder cell or encased in concrete shall be manufactured from ultraviolet-resistant resin pigmented with concrete-gray color, or be coated with a concrete-gray resin-rich exterior coating. Paint shall not be used. Fiberglass pipe treated with ultraviolet protection shall withstand a minimum of 2500 hours of accelerated weathering when tested in conformance with the requirements in ASTM Designation: G 154. Lamps shall be UV-B (313 nm wavelength). The resting cycle shall be 4 hours of ultraviolet (UV) exposure at 60°C, and then 4 hour of condensate exposure at 50°C. After testing, the surface of the pipe shall exhibit no fiber exposure, crazing, or checking, and only a slight chalking or color change.

Support spacing for fiberglass pipe shall be the same as shown on the plans for welded steel pipe. Pipe supports shall have a width of not less than 38 mm.

A Certificate of Compliance for fiberglass pipe and fittings shall be furnished to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate of Compliance shall include all laboratory test results conforming to the provisions specified herein.

For drainage piping NPS 8 or smaller, which is: (1) enclosed in a box girder cell and exposed for a length not greater than 6 m within the cell, or (2) encased in concrete, the Contractor shall have the option of substituting polyvinyl chloride (PVC) plastic pipe and fittings, with the same diameter and minimum bend radius as shown on the plans, for welded steel pipe.

The PVC plastic pipe and fittings shall be Schedule 40 conforming to the requirements of ASTM Designations: D 1785. The maximum support spacing for PVC plastic pipe shall be 2 m.

Couplings used to connect PVC plastic pipe or fiberglass pipe to steel shall be threaded or flanged. The sleeve connections shown on the plans shall not be used for either PVC plastic pipe or fiberglass pipe.

If PVC plastic pipe or fiberglass pipe is substituted for welded steel pipe, the quantity of drainage piping will be computed on the basis of the dimensions and details shown on the plans, and no change in the quantities to be paid for will be made because of the use of PVC plastic pipe or fiberglass pipe.

#### **10-1.67 PUMPING PLANT METAL WORK**

Pumping plant metal work shall conform to the provisions in Section 75, "Miscellaneous Metal," of the Standard Specifications and these special provisions.

The Contractor shall provide one heavy duty galvanized steel safety padlock hasp assembly with vertical staple of 3-mm diameter rod, minimum; and a slotted leaf at least 150 mm in length, securely attached to door and frame.

#### **10-1.68 MONUMENTS**

Survey monuments shall be constructed in conformance with the provisions in Section 81, "Monuments," of the Standard Specifications and these special provisions.

Concrete shall be Class 3 or minor concrete at the option of the Contractor.

The cast steel and gray cast iron frames and covers, including hardware, shall conform to the provisions in Section 55-2, "Materials," of the Standard Specifications.

#### **10-1.69 MARKERS AND DELINEATORS**

Markers and delineators shall conform to the provisions in Section 82, "Markers and Delineators," of the Standard Specifications and these special provisions.

Delineator (Class 1, surface mounted) and concrete barrier delineator (400 mm) shall be as specified in "Prequalified and Tested Signing and Delineation Materials" elsewhere in these special provisions. Delineator (Class 1, surface mounted) shall be cemented to the barrier with rapid set type epoxy adhesive as provided for cementing pavement markers to pavement in section 85-1.06, "Placement," of the Standard Specifications. Rapid Set Epoxy Adhesive shall conform to the requirements in Section 95-22.04 "Rapid Set Epoxy Adhesive for Pavement Markers," of the Standard Specifications. Delineators (Class 1, surface mounted) and concrete barrier delineators (400 mm) shall be applied only on clean, dry surfaces.

Quantities of delineators (class 1, surface mounted) and concrete barrier delineators (400 mm) to be paid for will be determined as units from actual count in place.

The contract unit price paid for delineator (Class 1, surface mounted) and concrete barrier delineators (400 mm) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work

involved in installing delineator (Class 1, surface mounted) and concrete barrier delineators (400 mm), complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Markers and delineators on flexible posts shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. Flexible posts shall be made from a flexible white plastic which shall be resistant to impact, ultraviolet light, ozone, and hydrocarbons. Flexible posts shall resist stiffening with age and shall be free of burns, discoloration, contamination, and other objectionable marks or defects which affect appearance or serviceability.

Retroreflective sheeting for metal and flexible target plates shall be the retroreflective sheeting designated for channelizers, markers, and delineators conforming to the requirements in ASTM Designation: D 4956-95 and in conformance with the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

#### **10-1.70 METAL BEAM GUARD RAILING**

Metal beam guard railing shall be constructed in conformance with the provisions in Section 83-1, "Railings," of the Standard Specifications and these special provisions.

Attention is directed to "Order of Work" of these special provisions.

Line posts and blocks shall be wood.

#### **TERMINAL SYSTEM (TYPE ET)**

Terminal system (Type ET) shall be furnished and installed as shown on the plans and in conformance with these special provisions.

Terminal system (Type ET) shall be an ET-2000 PLUS (4-tube system) extruder terminal as manufactured by Trinity Industries, Inc., and shall include all the items detailed for terminal system (Type ET) shown on the plans.

Arrangements have been made to insure that any successful bidder can obtain the ET-2000 PLUS (4-tube system) extruder terminal from the manufacturer, Trinity Industries Inc., P.O. Box 99, 950 West 400S, Centerville, UT 84014, Telephone 1-800-772-7976. The price quoted by the manufacturer for the ET-2000 PLUS (4-tube system) extruder terminal, FOB Centerville, Utah is \$1,305.00, not including sales tax.

The above price will be firm for orders placed on or before December 31, 2003, provided delivery is accepted within 90 days after the order is placed.

The Contractor shall provide the Engineer with a Certificate of Compliance from the manufacturer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate of Compliance shall certify that the terminal systems (Type ET) conform to the contract plans and specifications, conform to the prequalified design and material requirements, and were manufactured in conformance with the approved quality control program.

The terminal system (Type ET) shall be installed in conformance with the manufacturer's installation instructions and these requirements. The steel foundation tubes with soil plates attached shall be, at the Contractor's option, either driven, with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes shall be backfilled with selected earth, free of rock, placed in layers approximately 100 mm thick and each layer shall be moistened and thoroughly compacted. The wood terminal posts shall be inserted into the steel foundation tubes by hand and shall not be driven. Before the wood terminal posts are inserted, the inside surfaces of the steel foundation tubes to receive the wood posts shall be coated with a grease which will not melt or run at a temperature of 65°C or less. The edges of the wood terminal posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

Surplus excavated material remaining after the terminal system (Type ET) has been constructed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

#### **TERMINAL SYSTEM (TYPE SRT)**

Terminal system (Type SRT) shall be furnished and installed as shown on the plans and in conformance with these special provisions.

Terminal system (Type SRT) shall be a SRT-350 Slotted Rail Terminal (8 post system) as manufactured by Trinity Industries, Inc., and shall include all the items detailed for terminal system (Type SRT) shown on the plans.

The 5 mm x 44 mm x 75 mm plate washer shown on the elevation view and in Section D-D at Wood Post No. 1 shall be omitted.

Arrangements have been made to insure that any successful bidder can obtain the SRT-350 Slotted Rail Terminal (8 post system) from the manufacturer, Trinity Industries, Inc., P.O. Box 99, 950 West 400S, Centerville, UT 84014, Telephone 1-800-772-7976. The price quoted by the manufacturer for the SRT-350 Slotted Rail Terminal (8 post system), FOB Centerville, Utah is \$845.00, not including sales tax.

The above price will be firm for orders placed on or before December 31, 2003, provided delivery is accepted within 90 days after the order is placed.

The Contractor shall provide the Engineer with a Certificate of Compliance from the manufacturer in conformance with

the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate of Compliance shall certify that terminal systems (Type SRT) conform to the contract plans and specifications, conform to the prequalified design and material requirements and were manufactured in conformance with the approved quality control program.

The terminal system (Type SRT) shall be installed in conformance with the manufacturer's installation instructions and these requirements. The steel foundation tubes with soil plates attached, shall be, at the Contractor's option, either driven, with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes shall be backfilled with selected earth, free of rock, placed in layers approximately 100 mm thick and each layer shall be moistened and thoroughly compacted. Wood terminal posts shall be inserted into the steel foundation tubes by hand. Before the wood terminal posts are inserted, the inside surfaces of the steel foundation tubes to receive the wood posts shall be coated with a grease which will not melt or run at a temperature of 65°C or less. The edges of the wood terminal posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

Surplus excavated material remaining after the terminal system (Type SRT) has been constructed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

#### 10-1.71 METAL BRIDGE RAILING

Metal picket fencing, handrailing, pipe handrailing, and tubular handrailing shall conform to the provisions in Section 83-1, "Railings," of the Standard Specifications.

Exposed galvanized surfaces shall be prepared and painted in conformance with the provisions in Section 59-3, "Painting Galvanized Surfaces," of the Standard Specifications and these special provisions.

Exposed areas of galvanized surfaces shall receive a minimum of 2 finish coats of paint conforming to either the requirements for White Tintable Finish Paint-Waterborne, Formula PWB-164B, or an exterior grade latex paint formulated for use on properly prepared surfaces and conforming to the following:

A.

Property	Value	ASTM Designation
Pigment content, percent	24 max.	D 3723
Nonvolatile content, mass percent	49 min.	D 2369
Consistency, KU	75 min. to 90 max.	D 562
Fineness of grind, Hegman	less than 25-μm	D 1210
Drying time at 25°C, 50% RH, 100-μm wet film:		D 1640
Set to touch, minutes	30 max.	
Dry through, hours	1 max.	
Adhesion	4A	D 3359, Procedure A

B. No visible color change in the finish coats shall occur when tested in conformance with the requirements in ASTM Designation: G 53 using FS 40 UV-B bulbs for a minimum of 38 cycles. The cycle shall be 4 hours of ultraviolet (UV) exposure at 60°C and 4 hours of condensate exposure at 40°C.

C. The vehicle shall be an acrylic or modified acrylic copolymer with a minimum of necessary additives.

The total dry film thickness of all applications of the first finish coat shall be not less than 50 μm.

Except as approved by the Engineer, a minimum drying time of 12 hours shall be allowed between finish coats.

The second finish coat color shall match Federal Standard 595B, No. 27038. The total dry film thickness of all applications of the second finish coat shall be not less than 50 μm.

The 2 finish coats shall be applied in 2 or more applications to a total dry film thickness of not less than 100 μm nor more than 200 μm.

#### 10-1.72 CABLE RAILING

Cable railing shall conform to the provisions in Section 83-1, "Railings," of the Standard Specifications.

#### 10-1.73 CONCRETE BARRIER

Concrete barriers shall conform to the provisions in Section 83-2, "Barriers," of the Standard Specifications and these special provisions.

All concrete barriers will be measured along the traffic side of the toe of the barrier.

Type 732A concrete barriers will be measured and paid for as concrete barrier (Type 732).

Type 742A concrete barriers will be measured and paid for as concrete barrier (Type 742).

Concrete barrier transition from type 742 to type 732 will be measured and paid for as concrete barrier (Type 732).

The concrete barrier associated with the barrier slab on top of the mechanically stabilized embankment retaining walls will be measured and paid for as concrete barrier (Type 732 modified).

#### **10-1.74 CRASH CUSHION (ADIEM)**

Crash cushion shall be furnished and installed as shown on the plans and in conformance with the provisions in the Standard Specifications and these special provisions.

Crash cushion shall be an ADIEM II-350 as manufactured by Trinity Industries, Inc., and shall include the items detailed for crash cushion shown on the plans.

The successful bidder can obtain the crash cushion from the manufacturer, Trinity Industries, Inc., P.O. Box 99, 950 West 400S, Centerville, Utah 84014, telephone 1-800-772-7976.

The price quoted by the manufacturer for ADIEM II-350, FOB Centerville, Utah is \$11,500.00 not including sales tax.

The above price will be firm for orders placed on or before December 31, 2003, provided delivery is accepted within 90 days after the order is placed.

The Contractor shall furnish the Engineer one copy of the manufacturer's plan and parts list.

The Contractor shall provide the Engineer with a Certificate of Compliance from the manufacturer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate of Compliance shall certify that the crash cushion conforms to the contract plans and specifications, conforms to the prequalified design and material requirements, and was manufactured in conformance with the approved quality control program.

Crash cushion shall be installed in conformance with the manufacturer's installation instructions.

Surplus excavated material remaining after the crash cushion has been installed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

Crash cushion (ADIEM) will be measured by the unit as determined from actual count in place in the completed work.

The contract unit price paid for crash cushion (ADIEM) shall include full compensation for furnishing all labor, materials (including anchor bolts, nuts, washers, and marker panels), tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing the ADIEM type crash cushion, complete in place, including structure excavation, structure backfill, and disposing of surplus material, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

#### **10-1.75 THERMOPLASTIC TRAFFIC STRIPE AND PAVEMENT MARKING**

Thermoplastic traffic stripes (traffic lines) and pavement markings shall be applied in conformance with the provisions in Section 84, "Traffic Stripes and Pavement Markings," of the Standard Specifications and these special provisions.

Thermoplastic material shall be free of lead and chromium, and shall conform to the requirements in State Specification PTH-02ALKYD.

Retroreflectivity of the thermoplastic traffic stripes and pavement markings shall conform to the requirements in ASTM Designation: D 6359-99. White thermoplastic traffic stripes and pavement markings shall have a minimum initial retroreflectivity of  $250 \text{ mcd} \cdot \text{m}^{-2} \cdot \text{lx}^{-1}$ . Yellow thermoplastic traffic stripes and pavement markings shall have a minimum initial retroreflectivity of  $150 \text{ mcd} \cdot \text{m}^{-2} \cdot \text{lx}^{-1}$ .

Where striping joins existing striping, as shown on the plans, the Contractor shall begin and end the transition from the existing striping pattern into or from the new striping pattern a sufficient distance to ensure continuity of the striping pattern.

Thermoplastic traffic stripes shall be applied at the minimum thickness and application rate as specified below. The minimum application rate is based on a solid stripe of 100 mm in width.

Minimum Stripe Thickness (mm)	Minimum Application Rate (kg/m)
2.0	0.4

Thermoplastic traffic stripes and pavement markings shall be free of runs, bubbles, craters, drag marks, stretch marks, and debris.

At the option of the Contractor, permanent traffic striping and pavement marking tape conforming to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions may be placed instead of the thermoplastic traffic stripes and pavement markings specified herein. Permanent tape, if used, shall be installed in conformance with the manufacturer's specifications.

If permanent tape is placed instead of thermoplastic traffic stripes and pavement markings, the tape will be measured and paid for by the meter as thermoplastic traffic stripe and by the square meter as thermoplastic pavement marking.

### **10-1.76 PAVEMENT MARKERS**

Pavement markers shall be placed in conformance with the provisions in Section 85, "Pavement Markers," of the Standard Specifications and these special provisions.

Attention is directed to "Traffic Control System For Lane Closure" of these special provisions regarding the use of moving lane closures during placement of pavement markers with bituminous adhesive.

The Contractor shall furnish the Engineer certificates of compliance for the pavement markers in conformance with the provisions in Section 6-1.07, "Certificates of Compliance" of the Standard Specifications.

Retroreflective pavement markers shall be marked as abrasion resistant on the body of the markers.

### **SECTION 10-2. (BLANK)**

### **SECTION 10-3. SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS**

#### **10-3.01 DESCRIPTION**

Traffic signals, flashing beacons, lighting,— sign illumination, and ramp metering systems, shall conform to the provisions in Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications and these special provisions.

Lighting equipment is included in the following structures:

- A. Douglas Boulevard to Sunrise Avenue Fly-over Bridge
- B. Sunrise Avenue to Eastbound I-80 Tunnel

Traffic signal work shall be performed at the following locations:

- A. Intersection of Westbound I-80 Off-Ramp with Douglas Boulevard
- B. Intersection of Eastbound I-80 On/Off-Ramp with Douglas Boulevard
- C. Intersection of Oakridge Drive with Sunrise Avenue

#### **10-3.02 COST BREAK-DOWN**

Cost break-downs shall conform to the provisions in Section 86-1.03, "Cost Break-Down," of the Standard Specifications and these special provisions.

The Engineer shall be furnished a cost break-down for each contract lump sum item of work described in this Section 10-3.

The cost break-down shall be submitted to the Engineer for approval within 15 days after the contract has been approved. The cost break-down shall be approved, in writing, by the Engineer before any partial payment for the items of electrical work will be made.

#### **10-3.03 EQUIPMENT LIST AND DRAWINGS**

The controller cabinet schematic wiring diagram and intersection sketch shall be combined into one drawing, so that, when the cabinet door is fully open, the drawing is oriented with the intersection.

A maintenance manual shall be furnished for all controller units, auxiliary equipment, and vehicle detector sensor units, control units, and amplifiers. The maintenance manual and operation manual may be combined into one manual. The maintenance manual or combined maintenance and operation manual shall be submitted at the time the controllers are delivered for testing or, if ordered by the Engineer, prior to purchase. The maintenance manual shall include, but need not be limited to, the following items:

- A. Specifications
- B. Design characteristics
- C. General operation theory
- D. Function of all controls
- E. Trouble shooting procedure (diagnostic routine)
- F. Block circuit diagram
- G. Geographical layout of components
- H. Schematic diagrams
- I. List of replaceable component parts with stock numbers

#### 10-3.04 MAINTAINING EXISTING AND TEMPORARY ELECTRICAL SYSTEMS

Traffic signal system shutdowns shall be limited to periods between the hours of 9 a.m. and 3 p.m., Monday through Thursday.

#### 10-3.05 FOUNDATIONS

Reinforced cast-in-drilled-hole concrete pile foundations for traffic signal and lighting standards shall conform to the provisions in "Piling" of these special provisions.

Where cast-in-drilled-hole concrete pile foundations are to be constructed in slag aggregate embankments, the diameter of the pile shall be increased to provide a minimum of 75 mm of concrete cover over the reinforcing steel.

Full compensation for the increased diameter of cast-in-drilled-hole concrete pile foundations in slag aggregate embankments, including additional portland cement concrete, and increased drilling and placement costs shall be considered as included in the contract lump sum price paid for the item requiring the cast-in-drilled-hole concrete pile foundation and no additional compensation will be allowed therefor.

#### 10-3.06 STANDARDS, STEEL PEDESTALS AND POSTS

Standards, steel pedestals and posts for traffic signal and lighting standards shall conform to the provisions in "Steel Structures" of these special provisions.

Where the plans refer to the side tenon detail at the end of the signal mast arm, the applicable tip tenon detail may be substituted.

The sign mounting hardware shall be installed at the locations shown on the plans.

The sign panels will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

Type 1 standards shall be assembled and set with the handhole on the downstream side of the pole in relation to traffic or as shown on the plans.

All ferrous metal parts of tubular sign structures shall be galvanized and shall not be painted.

#### 10-3.07 CONDUIT

Conduit to be installed underground and in foundation shall be Type 3 unless otherwise specified.

Conduit sizes shown on the plans and specified in the Standard Specifications and these special provisions are referenced to metallic type conduit. When rigid non-metallic conduit is required or allowed, the nominal equivalent industry size shall be used as shown in the following table:

Size Designation for Metallic Type Conduit	Equivalent Size for Rigid Non-metallic Conduit
21	20
27	25
41	40
53	50
63	65
78	75
103	100

After conductors have been installed, the ends of all conduits shall be sealed with an approved type of sealing compound.

At those locations where conduit is required to be installed under pavement and existing underground facilities require special precautions in conformance with the provisions in "Obstructions" of these special provisions, conduit shall be placed by the "Trenching in Pavement Method" in conformance with the provisions in Section 86-2.05C, "Installation," of the Standard Specifications.

At the option of the Contractor, the final 0.6-m of conduit entering a pull box in a reinforced concrete structure may be Type 4.

#### 10-3.08 PULL BOXES

Grout shall not be placed in the bottom of pull boxes.

Pull boxes shall be the non-PCC type when not in a concrete surface, Asphalt Concrete surface, or where the pull box is not adjacent to a standard.

A pull box marker shall be placed at each pull box not in a concrete surface, Asphalt Concrete surface, or where the pull box is not adjacent to a standard. Markers shall comply with Type K-2 Marker as shown on Standard Plan Sheet A73A

except no reflectorization will be required. A State-furnished non-reflective green identification strip shall be applied to each marker.

Full compensation for furnishing and installing pull box markers and applying State furnished green identification strips shall be considered as included in the contract lump sum price paid for the electrical work requiring the pull box marker and no separate payment will be made therefor.

### **10-3.09 CONDUCTORS AND WIRING**

Splices shall be insulated by "Method B" or, at the Contractor's option, splices of conductors shall be insulated with heat-shrink tubing of the appropriate size after thoroughly painting the spliced conductors with electrical insulating coating.

The minimum insulation thickness, at any point, for Type USE, RHH or RHW wire shall be 1.0 mm for conductor sizes No. 14 to No. 10, inclusive, and 1.3 mm for No. 8 to No. 2, inclusive. The minimum insulation thickness, at any point, for Type THW and TW wires shall be 0.69 mm for conductor sizes No. 14 to No. 10, inclusive, 1.02 mm for No. 8, and 1.37 mm for No. 6 to No. 2, inclusive.

#### **SIGNAL INTERCONNECT CABLE.**

Signal Interconnect Cable (SIC) shall be the 6-pair type.

### **10-3.10 SERVICE**

Continuous welding of exterior seams in service equipment enclosures is not required.

Type III service equipment enclosures shall be the aluminum type.

Circuit breakers shall be the cable-in/cable-out type, mounted on non-energized clips. All circuit breakers shall be mounted vertically with the up position of the handle being the "ON" position.

Each service shall be provided with up to 2 main circuit breakers which shall disconnect ungrounded service entrance conductors. Where the "Main" circuit breaker consists of 2 circuit breakers as shown on the plans or required in the special provisions, each of the circuit breakers shall have a minimum interrupting capacity of 10 000 A, rms.

### **10-3.11 SIGN DISCONNECTS**

Sign disconnects shall be fused switches.

### **10-3.12 NUMBERING ELECTRICAL EQUIPMENT**

Self-adhesive reflective numbers and edge sealer will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

The numbers and edge sealer shall be placed on the equipment where designated by the Engineer.

Where new numbers are to be placed on existing or relocated equipment, the existing numbers shall be removed.

Reflective numbers shall be applied to a clean surface. Only the edges of the numbers shall be treated with edge sealer.

Where shown on the plans, 5-digit, self-adhesive equipment numbers shall be placed for all electroliers, soffit lighting, sign lighting, and service pedestals. On service pedestals, the numbers shall be placed on the front door. On electroliers, the numbers shall be placed as shown on the plans.

Numbers for illuminated signs mounted on overcrossings or for soffit luminaires shall be placed on the nearest adjacent bent or abutment at approximately the same station as the sign or soffit luminaire. Where no bent or abutment exists near the sign or soffit luminaire, the number shall be placed on the underside of the structure adjacent to the sign or soffit luminaire. Arrangement of numbers shall be the same as those used for electroliers.

Numbers for overhead sign bridges shall be placed on both posts.

### **10-3.13 STATE-FURNISHED CONTROLLER ASSEMBLIES**

The Model 170 controller assemblies, including controller unit, completely wired controller cabinet and inductive loop detector sensor units, but without anchor bolts, will be State-furnished as provided under "Materials" of these special provisions.

The Contractor shall construct each controller cabinet foundation as shown on the plans for Model 332 and 334 cabinets (including furnishing and installing anchor bolts), shall install the controller cabinet on the foundation, and shall make field wiring connections to the terminal blocks in the controller cabinet.

A listing of field conductor terminations, in each State-furnished controller cabinet, will be furnished free of charge to the Contractor at the site of the work.

State forces will maintain controller assemblies. The Contractor's responsibility for controller assemblies shall be limited to conforming to the provisions in Section 6-1.02, "State-Furnished Materials," of the Standard Specifications.



#### **10-3.14 TELEPHONE BRIDGE**

Telephone bridges shall conform to the provisions in Section 86-3.07A, "Telephone Bridge," of the Standard Specifications and these special provisions.

Each telephone bridge shall be installed inside the controller cabinet as shown on the plans.

#### **10-3.15 VEHICLE SIGNAL FACES AND SIGNAL HEADS**

Light Emitting Diode modules for vehicular traffic signal units (except programmed visibility type) will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

Type SV-1-T mountings with 5 sections and SV-2-TD mountings shall be bolted to the standard through the upper pipe fitting in the same manner shown for bolting the terminal compartment.

#### **10-3.16 PEDESTRIAN SIGNALS**

Light Emitting Diode modules for Type A pedestrian signals will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

#### **10-3.17 FLASHING BEACONS**

Sign panels to be mounted on each cantilever flashing beacon standard, and LEDs for the flashing beacon units and incandescent lamps for sign illumination, will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

#### **10-3.18 DETECTORS**

Loop detector sensor units will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

Loop wire shall be Type 1.

Loop detector lead-in cable shall be Type B.

Slots shall be filled with hot-melt rubberized asphalt sealant.

#### **10-3.19 EMERGENCY VEHICLE DETECTOR SYSTEM**

Each traffic signal shall have an emergency vehicle detector system which shall conform to the details shown on the plans and these special provisions.

##### **GENERAL**

Each emergency vehicle detector system shall consist of an optical emitter assembly or assemblies located on the appropriate vehicle and an optical detector/discriminator assembly or assemblies located at the traffic signal.

Emitter assemblies are not required for this project except units for testing purposes to demonstrate that the systems perform as specified. Tests shall be conducted in the presence of the Engineer as described below under "System Operation" during the signal test period. The Engineer shall be given a minimum of 2 working days notice prior to performing the tests.

Each system shall permit detection of 2 classes of authorized vehicles. Class I (mass transit) vehicles shall be detected at ranges of up to 300 m from the optical detector. Class II (emergency) vehicles shall be detected at ranges up to 550 m from the optical detector.

Class I signals (those emitted by Class I vehicles) shall be distinguished from Class II signals (those emitted by Class II vehicles) on the basis of the modulation frequency of the light from the respective emitter. The modulation frequency for Class I signal emitters shall be  $9.639 \text{ Hz} \pm 0.110 \text{ Hz}$ . The modulation frequency for Class II signal emitters shall be  $14.035 \text{ Hz} \pm 0.250 \text{ Hz}$ .

A system shall establish a priority of Class II vehicle signals over Class I vehicle signals and shall conform to the requirements in Section 25352 of the California Vehicle Code.

##### **EMITTER ASSEMBLY**

Each emitter assembly, provided for testing purposes, shall consist of an emitter unit, an emitter control unit, and connecting cables.

##### **General**

Each emitter assembly, including lamp, shall operate over an ambient temperature range of  $-34^{\circ}\text{C}$  to  $60^{\circ}\text{C}$  at both modulation frequencies and operate continuously at the higher frequency for a minimum of 3000 hours at  $25^{\circ}\text{C}$  ambient before failure of the lamp or other components.

Each emitter unit shall be controlled by a single, maintained-contact switch on the respective emitter control unit. The switch shall be located to be readily accessible to the vehicle driver. The control unit shall contain a pilot light to indicate that the emitter power circuit is energized and shall generate only one modulating code, either that for Class I vehicles or that for Class II vehicles.

### **Functional**

Each emitter unit shall transmit optical energy in one direction only.

The signal from each Class I signal emitter unit shall be detectable at a distance of 300 m when used with a standard optical detection/discriminator assembly and filter to eliminate visible light. Visible light shall be considered eliminated when the output of the emitter unit with the filter is less than an average of 0.0003-candela per energy pulse in the wavelength range of 380 nm to 750 nm when measured at a distance of 3 m. A Certificate of Compliance, conforming to the requirements in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications shall be submitted to the Engineer with each Class I emitter unit.

The signal from each Class II signal emitter unit shall be detectable at a distance of 550 m when used with a standard optical detection/discriminator assembly.

The standard optical detection/discriminator assembly to be used in making the range tests shall be available from the manufacturer of the system. A certified performance report shall be furnished with each assembly.

### **Electrical**

Each emitter assembly shall provide full light output with input voltages of between 12.5 V (dc) and 17.5 V (dc). An emitter assembly shall not be damaged by input voltages up to 7.5 V (dc) above supply voltage. The emitter assembly shall not generate voltage transients, on the input supply, which exceed the supply voltage by more than 4 volts.

Each emitter assembly shall consume not more than 100 W at 17.5 V (dc) and shall have a power input circuit breaker rated at 10 A to 12 A, 12 V (dc).

The design and circuitry of each emitter shall permit its use on vehicles with either negative or positive ground without disassembling or rewiring of the unit.

### **Mechanical**

Each emitter unit shall be housed in a weatherproof corrosion-resistant housing. The housing shall be provided with facilities to permit mounting on various types of vehicles and shall have provision for aligning the emitter unit properly and for locking the emitter unit into this alignment.

Each emitter control unit shall be provided with hardware to permit the unit to be mounted in or on an emergency vehicle or mass transit vehicle. Where required for certain emergency vehicles, the emitter control unit and exposed controls shall be weatherproof.

## **OPTICAL DETECTION/DISCRIMINATOR ASSEMBLY**

### **General**

Each optical detection/discriminator assembly shall consist of one or more optical detectors, connecting cable and a discriminator module.

Each assembly, when used with standard emitters, shall have a range of at least 300 m for Class I signals and 550 m for Class II signals. Standard emitters for both classes of signals shall be available from the manufacturer of the system. Range measurements shall be taken with all range adjustments on the discriminator module set to "maximum".

### **Optical Detector**

Each optical detector shall be a waterproof unit capable of receiving optical energy from two separately aimable directions. The horizontal angle between the 2 directions shall be variable from 180 degrees to 5 degrees.

The reception angle for each photocell assembly shall be a maximum of 8 degrees in all directions about the aiming axis of the assembly. Measurements of reception angle will be taken at a range of 300 m for a Type I emitter and at a range of 550 m for a Type II emitter.

Internal circuitry shall be solid state and electrical power shall be provided by the associated discriminator module.

Each optical detector shall be contained in a housing, which shall include 2 rotatable photocell assemblies, an electronic assembly and a base. The base shall have an opening to permit mounting on a mast arm or a vertical pipe nipple, or suspension from a span wire. The mounting opening shall have female threads for Size 21 conduit. A cable entrance shall be provided which shall have male threads and gasketing to permit a waterproof cable connection. Each detector shall have mass of less than 1.1 kg and shall present a maximum wind load area of 230 cm<sup>2</sup>. The housing shall be provided with weep

holes to permit drainage of condensed moisture.

Each optical detector shall be installed, wired and aimed as specified by the manufacturer.

### **Cable**

Optical detector cable (EV-C) shall meet the requirements of IPCEA-S-61-402/NEMA WC 5, Section 7.4, 600-V (ac) control cable, 75°C, Type B, and the following:

- A. The cable shall contain 3 conductors, each of which shall be No. 20 (7 x 28) stranded, tinned copper with low-density polyethylene insulation. Minimum average insulation thickness shall be 0.63-mm. Insulation of individual conductors shall be color coded: 1-yellow, 1-blue, 1-orange.
- B. The shield shall be either tinned copper braid or aluminized polyester film with a nominal 20 percent overlap. Where film is used, a No. 20 (7 x 28) stranded, tinned, bare drain wire shall be placed between the insulated conductors and the shield and in contact with the conductive surface of the shield.
- C. The jacket shall be black polyvinyl chloride with minimum ratings of 600 V (ac) and 80°C and a minimum average thickness of 1.1 mm. The jacket shall be marked as required by IPCEA/NEMA.
- D. The finished outside diameter of the cable shall not exceed 8.9 mm.
- E. The capacitance, as measured between any conductor and the other conductors and the shield, shall not exceed 157 pf per meter at 1000 Hz.
- F. The cable run between each detector and the controller cabinet shall be continuous without splices or shall be spliced only as directed by the detector manufacturer.

### **Discriminator Module**

Each discriminator module shall be designed to be compatible and usable with a Model 170 controller unit and to be mounted in the input file of a Model 334 controller cabinet, and shall conform to the requirements of Chapter I of the State of California, Department of Transportation, "Traffic Signal Control Equipment Specifications."

Each discriminator module shall be capable of operating two channels, each of which shall provide an independent output for each separate input.

Each discriminator module, when used with its associated detectors, shall perform the following:

- A. Receive Class I signals at a range of up to 300 m and Class II signals at a range of up to 550 m.
- B. Decode the signals, on the basis of frequency, at  $9.639 \text{ Hz} \pm 0.119 \text{ Hz}$  for Class I signals and  $14.035 \text{ Hz} \pm 0.255 \text{ Hz}$  for Class II signals.
- C. Establish the validity of received signals on the basis of frequency and length of time received. A signal shall be considered valid only when received for more than 0.50-second. No combination of Class I signals shall be recognized as a Class II signal regardless of the number of signals being received, up to a maximum of 10 signals. Once a valid signal has been recognized, the effect shall be held by the module in the event of temporary loss of the signal for a period adjustable from 4.5 seconds to 11 seconds in at least 2 steps at  $5 \text{ seconds} \pm 0.5 \text{ second}$  and  $10 \text{ seconds} \pm 0.5 \text{ second}$ .
- D. Provide an output for each channel that will result in a "low" or grounded condition of the appropriate input of a Model 170 controller unit. For Class I signals the output shall be a  $6.25 \text{ Hz} \pm 0.1 \text{ percent}$ , rectangular waveform with a 50 percent duty cycle. For Class II signals the output shall be steady.

Each discriminator module shall receive electric power from the controller cabinet at either 24 V (dc) or 120 V (ac).

Each channel together with the channel's associated detectors shall draw not more than 100 mA at 24 V (dc) or more than 100 mA at 120 V (ac). Electric power, one detector input for each channel and one output for each channel shall terminate at the printed circuit board edge connector pins listed below:

BOARD EDGE CONNECTOR PIN ASSIGNMENT

A	DC ground		
B	+24 V (dc)	P	(NC)
C	(NC)		
D	Detector input, Channel A	R	(NC)
E	+24V (dc) to detectors	S	(NC)
F	Channel A output (C)	T	(NC)
		U	(NC)
H	Channel A output (E)	V	(NC)
J	Detector input, Channel B	W	Channel B Output (C)
K	DC Ground to detectors	X	Channel B Output (E)
L	Chassis ground	Y	(NC)
M	AC-	Z	(NC)
N	AC+		

(C) Collector, Slotted for Keying

(E) Emitter, Slotted for Keying

(NC) Not connected, cannot be used by manufacturer for any purpose.

Two auxiliary inputs for each channel shall enter each module through the front panel connector. Pin assignment for the connector shall be as follows:

- A. Auxiliary detector 1 input, Channel A
- B. Auxiliary detector 2 input, Channel A
- C. Auxiliary detector 1 input, Channel B
- D. Auxiliary detector 2 input, Channel B

Each channel output shall be an optically isolated NPN open collector transistor capable of sinking 50 mA at 30 V (ac) and shall be compatible with the Model 170 controller unit inputs.

Each discriminator module shall be provided with means of preventing transients received by the detector from affecting the Model 170 controller assembly.

Each discriminator module shall have a single connector board and shall occupy one slot width of the input file. The front panel of each module shall have a handle to facilitate withdrawal and the following controls and indicators for each channel:

- A. Three separate range adjustments each for both Class I and Class II signals.
- B. A 3-position, center-off, momentary contact switch, one position (down) labeled for test operation of Class I signals, and one position (up) labeled for test operation of Class II signals.
- C. A "signal" indication and a "call" indication each for Class I and for Class II signals. The "signal" indication denotes that a signal above the threshold level has been received. A "call" indication denotes that a steady, validly coded signal has been received. These 2 indications may be accomplished with a single indication lamp; "signal" being denoted by a flashing indication and "call" with a steady indication.

In addition, the front panel shall be provided with a single circular, bayonet-captured, multi-pin connector for 2 auxiliary detector inputs for each channel. Connector shall be a mechanical configuration conforming to the requirements in Military Specification MIL-C-26482 with 10-4 insert arrangement, such as Burndy Trim Trio Bantamate Series, consisting of the following:

- A. Wall mounting receptacle, G0B10-4PNE with SM20M-1S6 gold plated pins.
- B. Plug, G6L10-4SNE with SC20M-1S6 gold plated sockets, cable clamp and strain relief that shall provide for a right angle turn within 65 mm maximum from the front panel surface of the discriminator module.

### Cabinet Wiring

The Model 332 cabinet has provisions for connections between the optical detectors, the discriminator module and the Model 170 controller unit.

Wiring for a Model 332 cabinet shall conform to the following:

- A. Slots 12 and 13 of input file "J" have each been wired to accept a 2-channel module.
- B. Field wiring for the primary detectors, except 24-V (dc) power, shall terminate on either terminal board TB-9 in the controller cabinet or on the rear of input file "J," depending on cabinet configuration. Where TB-9 is used, position assignments shall be as follows:

Position	Assignment
4	Channel A detector input, 1st module (Slot J-12)
5	Channel B detector input, 1st module (Slot J-12)
7	Channel A detector input, 2nd module (Slot J-13)
8	Channel B detector input, 2nd module (Slot J-13)

The 24-V (dc) cabinet power will be available at Position 1 of terminal board TB-1 in the controller cabinet.

Field wiring for the auxiliary detectors shall terminate on terminal board TB-O in the controller cabinet. Position assignments are as follows:

FOR MODULE 1 (J-12)		FOR MODULE 2 (J-13)	
Position	Assignment	Position	Assignment
1	+24V (dc) from (J-12E)	7	+24V (dc) from (J-13E)
2	Detector ground From (J-12K)	8	Detector ground from (J-13K)
3	Channel A auxiliary detector input 1	9	Channel A auxiliary detector input 1
4	Channel A auxiliary detector input 2	10	Channel A auxiliary detector input 2
5	Channel B auxiliary detector input 1	11	Channel B auxiliary detector input 1
6	Channel B auxiliary detector input 2	12	Channel B auxiliary detector input 2

### SYSTEM OPERATION

The Contractor shall demonstrate that the components of each system are compatible and will perform satisfactorily as a system. Satisfactory performance shall be determined using the following test procedure during the functional test period:

- A. Each system to be used for testing shall consist of an optical emitter assembly, an optical detector, an optical detector cable and a discriminator module.
- B. The discriminator modules shall be installed in the proper input file slot of the Model 170 controller assembly.
- C. Two tests shall be conducted; one using a Class I signal emitter and a distance of 300 m between the emitter and the detector, the other using a Class II signal emitter and a distance of 550 m between the emitter and the detector. Range adjustments on the module shall be set to "Maximum" for each test.
- D. Each test shall be conducted for a period of one hour, during which the emitter shall be operated for 30 cycles, each consisting of a one minute "on" interval and a one minute "off" interval. During the total test period the emitter signal shall cause the proper response from the Model 170 controller unit during each "on" interval and there shall be no improper operation of either the Model 170 controller unit or the monitor during each "off" interval.

#### 10-3.20 PEDESTRIAN PUSH BUTTONS

At the option of the Contractor, pedestrian push button housings may be the plastic type.

#### 10-3.21 LUMINAIRES

Ballasts shall be the lag or lead regulator, non-regulating reactor, autotransformer or high reactance type.

Ballasts shall be the lag type magnetic regulator type for City of Roseville Luminaires.

#### 10-3.22 PHOTOELECTRIC CONTROLS

Contactors shall be the mechanical armature type.

Photoelectric units for illuminated signs shall have a "turn-on" level of between 215 lux and 323 lux (corresponds to a switching level of approximately 430 lux to 646 lux measured in the horizontal plane). "Turn-off" level shall not exceed 3

times the "turn-on" level.

### **10-3.23 EXTINGUISHABLE MESSAGE SIGN**

Each extinguishable message sign shall be an internally illuminated weathertight and dust tight unit which will produce a clearly visible message only when internally illuminated and shall conform to these special provisions.

The design of each sign shall be as shown on the plans. Minor details of construction shown are typical and may be modified subject to approval by the Engineer.

Six sets of shop drawings shall be submitted to the Engineer for review prior to performing work on the signs.

#### **HOUSING**

The housing shall be ruggedly constructed, shall be rigid, weathertight, dust tight and corrosion resistant, and shall be made of durable materials.

Provisions shall be made for ease of maintenance of components.

Sign panels and housing window shall be made of acrylic plastic which, including painted portions, shall be highly resistant to crazing, staining, discoloration, creep, warping, and the long range deleterious effects of vehicle fumes, direct sunlight, heat (up to 90°C), water, oils and aging.

The housing skin shall be made of Type 5052-H32 aluminum alloy sheet with clad finish. The housing reinforcing and miscellaneous parts shall be made of suitable gages and types of aluminum, except external fasteners, machine screw parts, lock washers, hinge pins, and other mechanical parts, which shall be made of Type 316 stainless steel.

Interior metal parts shall be made of suitable gages and types of plated steel or aluminum, except fasteners, machine screw parts, lock washers and other miscellaneous parts shall be made of corrosion resistant metals other than aluminum.

The separable hinge for mounting the reflector shall be brass as shown on the plans or shall be stainless steel.

Gaskets shall be uniform and even textured, and shall be highly resistant to stiffening and setting and the long range deleterious effects of vehicle fumes, direct sunlight, heat (up to 70°C), water, oils and aging.

Terminal strips shall be used for input, output and tie point connections and shall be of the molded phenolic, barrier type.

#### **BALLASTS, CONTROL RELAYS AND TERMINAL BLOCKS**

Ballast inductors shall meet the requirements in ANSI Standard: C82.1, "Fluorescent Lamp Ballasts."

The inductors shall have the inductance noted on the plans ( $\pm 10$  percent), losses not exceeding 15 percent of lamp watts at rated current of inductor and a maximum current crest factor of 1.5 at rated current of inductor. The maximum temperature rise of the inductor coils shall be limited to 40°C above an ambient temperature of 40°C.

Heater transformers shall produce the rated secondary voltage ( $\pm 10$  percent) at full load and at one-third load. The maximum temperature rise of the transformer coils shall not exceed 40°C above an ambient temperature of 40°C.

Inductors and transformers shall have cores made of a suitable grade of silicon steel lamination material and shall have thorough resin impregnation.

Each mounting chassis shall be fabricated of 3 mm, Type 5052-H32 aluminum alloy sheet. Units shall be mounted on the chassis with plated brass or steel hardware, except for lock washers which shall be beryllium copper, externally toothed.

Capacitors shall be rated 660 V (ac), 60 Hz, for operation down to -20°C with capacity as shown on the plans and shall be oil filled, paper type, hermetically sealed with solder lug terminals. Capacitance shall be within  $\pm 10$  percent of rating at 25°C. Each capacitor shall withstand a limited direct current, 15-second breakdown test at 25°C of 3000 V (ac) from each terminal to case. Minimum insulation leakage resistance from terminal to terminal, in megohms, shall be not less than 1500 divided by capacitance in microfarads.

Each magnetic control relay shall be of the heavy-duty, power type with 120-V (ac) coil and double-pole, double-throw contacts with a minimum rating of 2 A at 480 V (ac), 60 Hz. The coil shall consume not more than 10 VA with sealed armature.

The relay coil shall be designed to provide reliable service under the following conditions:

- A. Maximum operating voltage: 10 percent over rated volts.
- B. Ambient temperature: 60°C.

The relay coil shall meet NEMA requirements for temperature rise and voltage breakdown.

Maximum dimensions of the relay shall be: mounting base, 63.5 mm by 102 mm; overall height, 63.5 mm.

Fuseholders shall be the panel mounting type rated at 250 V (ac), complete with a 10.3-mm diameter by 38-mm length, slow blowing, cartridge type fuse.

Surge limiting and ballast resistors shall be ceramic coated, 20-watt, wirewound units. Resistor leads shall have plastic insulation rated 600 V (ac), for operation at 200°C.

Wiring connections from components shall be terminated on 2 molded phenolic, barrier type, terminal block assemblies rated at 15 A, 600 V (ac). Terminal designations shall be marked as indicated on the plans.

#### **LAMP HOLDERS AND LAMPS**

Lamp holders shall have silver plated contacts.

Lamps shall be the extra-high output, rapid-start type with T-12 bulb of the length shown on the plans, cool-white color and plated contacts for operation up to 1500 mA.

#### **CONDUCTORS AND WIRING**

Ballast and sign conductors shall be No. 16 stranded copper wire and shall be labeled by UL as 105°C appliance wiring material (AWM) for use at 600 V (ac). Ballast conductors shall be secured with easily removable, spring cross straps (not clamped, cabled or served) on the underside of the chassis. Color coding and terminal markings shall be as shown on the plans.

Lead ends shall be fitted with spade lugs.

#### **LUG DISCONNECT**

Each plug disconnect shall consist of molded nylon plug and receptacle housings containing plug pins and individual sockets designed to be crimped to conductors and snapped into the housings. Housings shall have integral, molded, polarizing and locking devices. Minimum UL electrical rating shall be 10 A, 600 V (ac). Pins and sockets shall be tin plated phosphor bronze secured to conductors using a ratchet type precision crimping tool.

#### **TESTING**

Tests shall verify that the following conditions exist:

- A. Transformer output voltage: 480 V (ac)  $\pm$  10 percent.
- B. Sign input current (daytime level): 4 A maximum.
- C. Lamp current each (daytime level): 1.4 A  $\pm$  15 percent (nighttime level) 30 mA  $\pm$  15 percent.
- D. Cathode filament voltage: 3.6 V (ac)  $\pm$  10 percent and shall be supplied from a steady (non-flashing) source.

#### **SIGN OPERATION**

The sign shall operate as follows:

- A. During daytime, the lamps shall operate at full rated brightness.
- B. During nighttime, the lamps shall be dimmed to approximately one-thirty-fifth of daytime brightness.
- C. Starting and flashing shall be positive, without flickering, during daytime and nighttime levels.

#### **10-3.24 REMOVING, REINSTALLING OR SALVAGING ELECTRICAL EQUIPMENT**

Salvaged City electrical materials shall be hauled to City of Roseville, Corporation Yard at 2090 Hilltop Circle, Roseville, Ca. and stockpiled.

Salvaged State electrical materials shall be hauled to Caltrans District 3 shop at 6010 Folsom Boulevard, Sacramento, Ca. and stockpiled.

The Contractor shall provide the equipment, as necessary, to safely unload and stockpile the material. A minimum of 2 working days' notice shall be given prior to delivery.

#### **10-3.25 DISPOSING OF ELECTRICAL EQUIPMENT**

Ballasts and transformers and fluorescent and mercury lamps shall be disposed of in conformance with California Department of Health Services Regulations set forth in Title 22, Division 4, Chapter 30, of the California Code of Regulations.

Ballasts and transformers that contain polychlorinated biphenyl (PCB) are designated as extremely hazardous wastes and fluorescent tubing and mercury lamps are designated as hazardous wastes under Title 22, Chapter 30, Article 9, Section 66680, of the California Code of Regulations.

The following electrical materials on the project are known to contain polychlorinated biphenyl (PCB):

- A. Transformers
- B. Ballasts

When 25 or more fluorescent lamps and mercury lamps, in combination, are to be disposed of, the lamps shall be treated as recyclable hazardous waste and shall be recycled within the State of California in conformance with Title 22, Chapter 30, Article 12, of the California Code of Regulations by a currently certified recycler such as, but not limited to, the following:

- A. Exceltrans Inc., P.O. Box 866, Benicia, CA 94510, Telephone (707) 745-8907.
- B. Roberts Enterprises, 2021 South Myrtle Avenue, Monrovia, CA 91016, Telephone (818) 303-2053.

The recyclable hazardous waste shall be packaged and then shipped via a currently certified hauler in conformance with Title 22, Chapter 30, Article 12, of the California Code of Regulations and other applicable local, State, and Federal regulations.

The Engineer shall be furnished with a statement noting which certified hauler and which certified recycler is proposed for utilization, together with a copy of the recycler's interim status document or a copy of the variance letter from the Department of Health Services. The statement shall be furnished within 15 calendar days after the contract has been approved by the Attorney General.

The State assumes generator responsibility for these wastes. The Engineer will prepare the Hazardous Waste Manifest for Shipment.

Full compensation for hauling, stockpiling, and disposing of fluorescent tubing and mercury lamps shall be considered as included in the contract price paid for the electrical item involved and no additional compensation will be allowed therefor.

After removal, handling and disposing of electrical material containing polychlorinated biphenyl (PCB) will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

#### **10-3.26 PAYMENT**

The contract lump sum price or prices paid for signal and lighting shall include highway lighting at intersections in connection with signals only.

Other roadway lighting on the project shall be considered as included in the contract lump sum price paid for lighting and sign illumination at various locations.

Full compensation for hauling and stockpiling electrical materials shall be considered as included in the contract price paid for the item requiring the material to be salvaged and no additional compensation will be allowed therefor.

### **SECTION 10-4. WATER SUPPLY SYSTEM**

#### **10-4.01 DESCRIPTION**

This work will consist of the construction of water mains and appurtenances, earthwork, removal, abandonment and salvage of existing water supply facilities; resetting, adjusting, or relocating existing water supply facilities, testing the completed water mains for pressure and leakage requirements, and disinfecting the completed water main, including all appurtenances, as shown on the plans or as directed by the Engineer and as specified in the standard specifications and these special provisions.

Existing hydrants shall not be impaired without approval from the Roseville Fire Department. In no event shall hydrants be impaired over night. Fire hydrants shall also not be obstructed. Once new hydrants are accepted by the Roseville Fire Department, they shall be treated the same as existing hydrants and maintained accessible and operational. Any existing fire hydrants indicated on the plans to be removed shall be saved and delivered to the location specified by the Fire Department.

#### **10-4.02 COST BREAK-DOWN**

The Contractor shall furnish the Engineer a cost break-down for the contract lump sum item of water supply system. The cost break-down table shall be submitted to the Engineer for approval within 15 working days after the contract has been approved. The cost break-down table shall be approved, in writing, by the Engineer before any partial payment will be made for the item of water supply system.

Attention is directed to "Time-Related Overhead" of these special provisions regarding compensation for time-related overhead.

The cost break-down shall be completed and furnished in the format shown in the sample of the cost break-down included in this section. Line item descriptions of work shown in the samples are the minimum to be submitted. Additional line item descriptions of work may be designated by the Contractor. If the Contractor elects to designate additional line item descriptions of work, the quantity, value and amount for those line items shall be completed in the same manner as for the line item descriptions shown in the samples. The line items and quantities given in the sample are to show the manner of



preparing the cost break-down to be furnished by the Contractor.

The Contractor shall determine the quantities required to complete the work shown on the plans. The quantities and their values shall be included in the cost break-down submitted to the Engineer for approval. The Contractor shall be responsible for the accuracy of the quantities and values used in the cost break-down submitted for approval.

The sum of the amounts for the line items of work listed in the cost break-down table for irrigation system work shall be equal to the contract lump sum price bid for the work. Overhead and profit, shall be included in each individual line item of work listed in the cost break-down table.

No adjustment in compensation will be made in the contract lump sum price paid for water supply system due to differences between the quantities shown in the cost break-down table furnished by the Contractor and the quantities required to complete the work as shown on the plans and as specified in these special provisions.

Individual line item values in the approved cost break-down table will be used to determine partial payments during the progress of the work and as the basis for calculating an adjustment in compensation for the contract lump sum item of water supply system due to changes in line items of work ordered by the Engineer. When the total value of ordered changes to line items of work increases or decreases the lump sum price bid for irrigation system by more than 25 percent, the adjustment in compensation will be determined in the same manner specified for increases and decreases in the total pay quantity of an item of work in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications.

**WATER SUPPLY SYSTEM COST BREAK-DOWN**  
**Contract No. 03-375604**

UNIT DESCRIPTION	UNIT	APPROXIMATE QUANTITY	VALUE	AMOUNT
Remove Water Line	M			
Abandon Water Line	EA			
200 mm Fire Protection Assembly	EA			
200 mm Fire Hydrant Assembly	EA			
152 mm Ductile Iron Pipe	M			
200 mm Ductile Iron Pipe	M			
400 mm Ductile Iron Pipe	M			
152 mm Gate Valve	EA			
200 mm Gate Valve	EA			
400 mm Butterfly Valve	EA			
51 mm Blow-Off Valve	EA			
51 mm Air Release Valve	EA			
Cut and Plug 152 mm Pipe	EA			
Cut and Plug 200 mm Pipe	EA			
Cut and Plug 400 mm Pipe	EA			
Thrust Block (Minor Concrete)	M3			
200 mm x 152 mm Tee Connection	EA			
400 mm x Concrete Cylinder Pipe to Ductile Iron Pipe	EA			
400 mm x Concrete Cylinder Pipe to Ductile Iron Pipe Tee	EA			
Ductile Iron Pipe to Unknown Materil Pipe	EA			

**TOTAL** \_\_\_\_\_

#### 10-4.03 MATERIALS

Materials shall conform to the requirements in this section and as shown on the plans.

##### **Ductile Iron Pipe and Fittings**

Ductile iron pipe (DIP) shall be manufactured in accordance with American National Standards Institute (ANSI)/American Water Works Association (AWWA) C151/21.51, latest revision, and conform to the thickness design standards of ANSI/AWWA C150/21.50. Fire service water mains serving fire hydrants shall be Class 50.

Fittings shall be ductile iron rated at 2414kilo Pascals (kPa) conforming to ANSI/AWWA C153/21.53.

Ductile iron pipe and fittings shall be provided with a double thickness of cement-mortar lining conforming to AWWA C104. The cement mortar lining shall be seal coated. Exterior surfaces of pipe and fittings shall be given a standard bituminous coating of coal-tar or asphalt of 0.0254 millimeters (mm) minimum thickness.

All ductile iron pipe and fittings shall be wrapped in polyethylene encasement in accordance with ANSI/AWWA C105/A21.5. Polyethylene film for encasement shall be low-density, type 1, having a nominal thickness of 0.2032 mm.

Joints for ductile iron pipe and fittings shall be mechanical joint conforming to the requirements of ANSI/AWWA C110/A21.10.

Gaskets for flange connections shall be neoprene rubber, red rubber, US Pipe, Flange Tite, or equal.

Insulating flange gaskets shall be insulation flange kits, Type E Full Face Gasket with two side insulation as manufactured by Calpico, or equal.

Flange bolts and nuts shall be minimum Grade 4, conforming to American Society of Testing and Materials (ASTM) A307 Grade Bd.

Tee bolts shall be 19mm high strength, low alloy steel with a heavy nut, conforming to AWWA C111.

Damaged pipe and fitting coatings and all bolts, nuts, rods and miscellaneous connecting pieces not provided with an acceptable factory coating shall be given two (2) coats of bituminastic paint after installation. Bituminastic paint shall be Cop-Coat Carboline Company bituminastic number 50, coal tar, or equal.

All pipe and fittings shall be plainly marked for weight and pressure rating.

Flexible couplings shall meet the requirements of AWWA C219 and be Dresser, Skinner, Smith-Blair or equal for class and type of pipe. Interior and exterior coatings shall be manufacturer applied in accordance with AWWA C550. The minimum dry coating thickness shall be 0.3048 mm unless the lining thickness is limited by the working tolerance of the coupling components. Flexible couplings shall provide a watertight seal suitable for 1724 kPa water pressure.

### **Concrete Cylinder Pipe**

Concrete cylinder pipe shall be in accordance with AWWA C303-95 or latest revision.

The internal coating shall be cement mortar in accordance with AWWA C303.

Pipe shall be marked on the exterior surface indicating manufacturer, design pressure, maximum backfill height, and date of manufacture.

Pipe deflection under external load shall not exceed  $D^2/4000$ , where D is the nominal pipe diameter. External loads shall be calculated using a transition width trench plus H-10 traffic loading. The unit weight of backfill material shall be 586 kgs/sq.meter and the Ku' soil factor shall be 0.150. Ring deflection shall be calculated from "Spangler's Formula" using a deflection lag factor of 1.25, a bedding constant K of 0.100, a soil modulus E' of 2760kPa, and a settlement-projection ratio of 0.3.

The pipe shall be designed for a working pressure of 690 kPa and a design/test pressure of 1034kPa.

All concrete cylinder pipe and fittings shall be wrapped in polyethylene encasement in accordance with ANSI/AWWA C105/A21.5. Polyethylene film for encasement shall be low-density, type 1, having a nominal thickness of 0.2032 mm.

### **Joint Restraint**

When mechanically restrained joints are required they shall be manufactured integrally with the pipe or provided as accessory mechanisms.

Mechanical joint retainer gland restraints for ductile iron pipe shall be designed to fit standard mechanical joint bells with standard "tee" head bolts conforming to ANSI/AWWA C111/A21.11 and ANSI/AWWA C153/A21.53. Glands shall be manufactured of ductile iron conforming to ASTM A36 grade 60-42-10.

Accessory restraining mechanisms shall consist of a sufficient number of individually set gripping surfaces, which impart a wedging action against the pipe. Set screws shall not be permitted. The gripping surfaces shall incorporate twist-off nuts to insure proper setting. Joint restraint devices shall be installed in accordance with manufacturer's recommendations and have a working pressure of 1724kPa, with a safety factor of 2. Approved joint restraint systems for DIP shall be Mega Lug 1100 Series as manufactured by EBAA Iron Sales, or equal.

### **Thrust Blocks**

Concrete for thrust blocks shall conform to the requirements in Section 90-10, "Minor Concrete," of the Standard Specifications.

Reinforcing Steel for thrust blocks shall conform to the requirements in Section 52, "Reinforcement," of the Standard Specifications.

Sizing of thrust blocks shall be as shown on the plans.

Thrust blocks used on fire service water mains shall be in accordance with National Fire Protection Association (NFPA) 24, Section 8-6.

### **Gate Valves**

Gate valves shall be of the iron body, bronze mounted, resilient seated, solid wedge disc, non-rising stem type, fitted with O-ring seals, conforming to the requirements of AWWA C509. Valves shall be suitable for 1379kPa minimum working pressure and 2760kPa test pressure. The operating nut shall be 50mm square and valves shall open “left” or counter-clockwise.

All interior and exterior surfaces of the valve body and bonnet and any exposed metallic surfaces of the gate shall be coated with a fusion-bonded epoxy conforming to the requirements of AWWA C-550.

Gate Valves shall be either M&H: 4067 RW Gate Valve, Mueller: A-2360 RS Gate Valve, US Pipe: Metro Seal 250, or equal.

### **Butterfly Valves**

Butterfly valves shall be “Pratt Ground Hog”, “Mueller Lineseal III”, or equal.

Valves shall be furnished with a holiday free epoxy, interior lining and standard black asphalt varnish exterior. Certification shall be provided by the Manufacturer stating the epoxy lining is holiday free.

### **Valve Boxes And Cover**

All valve boxes in street and other traffic areas shall be designed to H-20 loading conditions.

Blocking for valve boxes shall consist of: Concrete Stone 230mm x 25mm x 400mm , Slump Block 76mm x 76mm x 400mm, standard concrete brick, or equal.

All box lids shall be permanently marked/cast with the appropriate label (i.e., “WATER”, “ARV”, “BLOW-OFF”, “CPT”. etc.).

Riser aligners shall be used to maintain central position of valve operating nut within riser section. Riser aligners shall be as manufactured by Davis & Associates, or equal.

### **Valve Boxes And Cover (Main Valve Boxes)**

Main valve boxes shall be of three-piece construction, sleeve type construction consisting of a cast iron lid (cover), top section, and riser section.

The top section or box shall be concrete and have an iron ring to support the box lid.

The riser section shall be 200mm diameter Polyvinyl Chloride (PVC) C900 of the height required to set the top section at the proper elevation.

Valve boxes shall be as manufactured by Christy (Type G5, or Type B 17 by 30 H20), or BES, or equal.

### **Valve Boxes And Cover (Service Boxes)**

The riser stock shall be 150mm diameter Schedule 40 PVC C900 of the height required to set the top section at the proper elevation.

Valve boxes for 19mm to 25mm services shall be as manufactured by Christy or equal.

Valve boxes for 38mm to 50mm services shall be as manufactured by Christy or equal.

Valve boxes for 75mm to 100mm services shall be as manufactured by Christy or equal.

### **Fire Hydrants**

Fire hydrants shall be provided and installed in accordance with this section and with the details shown on the plans.

Fire hydrants are to be of the wet barrel type conforming to the requirements of AWWA C503. Fire hydrant head shall be made of bronze.

Fire hydrants shall be designed for a minimum working pressure of 1034kPa and test pressure of 2069kPa.

Fire hydrants shall be permanently marked to identify manufacturer, series number, and the year of manufacture.

Hose threads, valve stem nuts, and protector cap nuts shall be in conformity with the local water authority, or fire jurisdiction in which the fire hydrant will be placed.

Exterior of fire hydrant shall be painted with one coat primer and two finish coats of “safety yellow” enamel paint.

Fire hydrant bolts shall be “hollow break away,” 16mm x 90mm, conforming to ASTM – A307 Grade A & B Low Carbon Steel.

Fire hydrants shall be as manufactured by Clow, Model 2060, or equal.

### **Fire Hydrant Bury**

Fire hydrant buries shall be in conformance with AWWA C503, ductile iron mechanical jointed cross flange, and cement mortar lined per AWWA C104.

Fire hydrant buries shall be designed for a minimum working pressure of 1034kPa and test pressure of 2070kPa.

Fire hydrant buries shall be as manufactured by South Bay Foundry – Mechanical Joint (MJ) x (size), or equal.

### **Fire Hydrant Bury Extensions**

Fire hydrant bury extensions shall be grooved and cement mortar lined per AWWA C104.

Fire hydrant bury extensions shall be designed for a minimum working pressure of 1034kPa and test pressure of 2070kPa.

Fire hydrant bury extensions shall be as manufactured by Clow – Part # CW-EXT-BO (150mm x 150mm through 150mm x 915mm ), Tyler (150mm x 150mm through 150mm x 813mm or equal.

### **Fire Hydrant Check Valves**

Fire hydrant check valves shall be as manufactured by Little Squirt, or equal, in accordance with the following schedule:

Pressure Zone (kPa)	Part #
0 to 690	HCV6-90-110
690 to 862	HCV6-115-135
862 to 1034	HCV6-140-160
1034 to 1207	HCV6-165-185

Contact local water authority for pressure zone information

### **Backflow Assembly**

Backflow assemblies shall be as manufactured by the following, or equal:

Watts: 909 and 009 Series, 19mm to 250mm; 709 DCDA Series, 76mm to 250mm; 909 RPDA Series, 76mm to 250mm.

Wilkins: 975 Series, 19mm to 50mm only.

Ames: 3000 DCDA Stainless Steel Series, Outside Stem and Yoke (OS&Y), 76mm to 200mm; 3000 DCDA Epoxy Series, (OS&Y), 250mm only; 4000 RP Stainless Steel Series, (OS&Y or NRS), 76mm to 152 mm; 4000 RP Epoxy Series, (OS&Y or NRS), 200mm to 250 mm; 4000 B Series, 19mm to 50mm; 5000 RPDA Epoxy Series, (OS&Y), 100mm to 250mm.

Fire Protection Assembly (located at the Fire Department Connection site) shall be furnished and installed in accordance with the details shown on the plans. Assembly shall be manufactured by the following or equal:

Ames: 3000 DCDA Stainless Steel Series (OS&Y), 200mm, with stainless steel wye strainer sized based on pressure drop.

### **Corporation Stops**

Corporation stops shall be manufactured in accordance with AWWA C800 and be male iron pipe thread by compression and full throat ball valve design.

Corporation stops shall be as manufactured by Jones – Part # J-1935SG (19mm to 50mm), Mueller – Part # B-25028-MIPTXCTS-110 (Compression 19mm to 50mm), Part # N-35028-MIPTXCTS-110 (Compression 19mm to 25mm), or equal.

### **Service Saddles**

Service saddles shall be manufactured and tested in accordance with AWWA C800.

Service saddles on PVC pipe shall be as manufactured by Jones – Part # J-996 (100mm – 305mm saddles with 19mm through 50mm); Mueller – Part # H-13490 (100mm), Part # H-13491 (150mm), Part # H-13492 (200mm), Part # H-13493 (250mm), Part # H-13494 (305mm), or equal.

Service saddles on DIP pipe shall be as manufactured by Jones – Part # J-979 (100mm-305mm saddles with 19mm through 50mm); Mueller – Part # BR2B0474IP (100mm), Part # BR2B0684IP (150mm), Part # BR2B0899IP (200mm), Part # BR2B1104IP (250mm), Part # BR2B1314IP (305mm), or equal.

Zinc caps shall be used on all exposed bolt lengths where non-insulated corporation stops are used. Zinc caps shall be as manufactured by Mars (11mm to 13mm 70 grams (g) 16mm to 25mm 170 g), or equal.

### **Curb Stops**

Curb stops shall be manufactured in accordance with AWWA C800.

Curb stops shall be as manufactured by Jones – Part # 1921WSG (19mm to 50mm), Mueller – Part # B-25170-FIPTXCTS-110 (Compression 19mm to 50mm) or equal.

### **Copper Tubing and Fittings**

Copper service pipe shall be ASTM B88 Type K.

Fittings for copper tubing (19mm through 50mm) shall be brass as manufactured by Jones – Super Grip CTS x CTS J-2609SG, CTS x MIP J-2605SG, CTS x FIP J-2607SG, Compression x Compression; Mueller – 110-CTS H-15403, 110-CTS H-15428, 110-CTS H-15451, Compression x Compression, or equal.

### **Brass Pipe and Fittings**

Brass pipe shall conform to ASTM B-43 standards. A listing of approved pipes include: Hallstead 19mm through 50mm Red Brass, Cambridge-Lee, Federal WW-351, or equal.

Fittings shall conform to ANSI Standard B16.15, B16.24, B2.1, T-94-1 and be a minimum of Class 125. A listing of approved manufacturers includes: Lee Brass Merritt Brass, or equal.

### **Air Release Valves**

Air release valves shall be epoxy coated vacuum break type in accordance with AWWA C512.

Vacuum valves shall be as manufactured by Crispin (Part #'s UL10, UL20 UL 31, UL41, UL61, UL81), Valvematic (Part #'s 201C, 202C, 203C, 204C, 206C, 208C), or equal.

### **Blow Off**

Blow Off valves/hydrant shall be as manufactured by Kupferle, Eclipse #78 (50mm), or equal.

### **Freeze Protection**

Freeze protection materials shall be comprised of the following:

Laminated fabric conforming to Herculite #10 by Herculite Products (fabric shall be a minimum of 360 grams/sq. meter) or equal.

Brass Rolled Rim Grommet and spur washer by Astrup, or equal.

Polyester thread with a minimum strength of 6.4 Kg, Coats American's Star Ultra product line, or equal.

Fiberglass insulation R-19 rated, 152 mm minimum thickness.

50 mm minimum width Velcro, or equal.

Nylon zip ties.

### **Tracing Wire**

Tracing wire shall be 12 gauge minimum Type UF solid copper with plastic insulation.

Connectors for tracing wire shall be split-bolt type connectors as manufactured by Perminate Seal-Wire Connectors-Part #97811, or equal.

Tracing wire mastic tape shall be 3M Mastic Tape #2229, or equal.

### **Water Marking Tape**

Water pipe marking tape shall be as manufactured by Calpico Inc – Tracer Tape-Non-Detectable 305mm width, Reef Industries Inc, Terra Tape Extra Stretch 450 Material, or equal. The marking tape shall be labeled "Buried Water Main Below".

## **10-4.04 INSTALLATION**

### **Earthwork**

The pipe shall be laid in a trench excavated to the lines and grades established on the plans, or by the Engineer.

Bedding shall shaped to provide uniform and continuous support along the barrel of the pipe. The trench bottom shall be excavated at occurrences of pipe bells to provide the minimum depth of bedding under the bell. Blocking of the pipe is not permitted.

Where in the opinion of the Engineer rocky, unyielding, or unsuitable foundation material is encountered, the subgrade shall be excavated a minimum of 305mm below the pipe and the trench width shall be increased a minimum 305mm. The over-excavation shall be replaced with imported material. Ductile Iron Pipe may be used as an alternative to the over excavation requirements.

Where in the opinion of the Engineer the trench bottom is soft, yielding, or unstable the trench bottom shall be over-excavated. Nineteen millimeter crushed rock shall be placed in the trench to provide a stable foundation. The rock is in addition to the required pipe bedding used in the pipe zone.

Pipe bedding shall be carefully placed around the pipe to avoid displacement. Bedding shall first be placed to one-half the pipe diameter or no more than the lesser of 152 mm or one-third of the pipe diameter (pipes greater than 305mm diameter) and then shovel sliced under the haunches for the full length of pipe before subsequent layers of bedding are placed.

Bedding material shall be compacted to at least 90 percent of the maximum dry density.

### **Pipe Installation**

Contractor shall coordinate his work with the local water authority. The contractor shall prepare and coordinate a sequence of operations work plan through the local water authority wherever the work will require interaction of the existing distribution system (i.e. connections, termination/abandonment, flushing and disinfecting, taps, services, etc.). The work plan shall be devised such that no or minimum shut down time of the water distribution system occurs.

The Contractor shall not operate or manipulate any components or facilities of an active (in-service) water system. The Contractor shall contact the local water authority for operation of valves or other appurtenances of the active distribution system. Excepting emergency conditions, a minimum of 48 hours advance notice shall be given to the Water Authority.

Shut down of a main or service for an extended period of time without temporary facilities (more than 6 hours) is only allowed where indicated on the plans. The length of any section of water main, temporarily removed from service for the operations under the Contract, shall be determined by the capability of the distribution system to supply water by other routes to the areas adjacent to or directly affected by, the section of service. Water service to individual customers may be interrupted only during the Contractors work hours and as allowed by the Water Authority. The Contractor shall follow the local water authority procedures for contacting customers and fire departments that will be affected by temporary interruptions of service.

All pipe, fittings, valves and hydrants shall be carefully inspected for defects prior to installation.

Applicable installation standards are AWWA Manual M23 (PVC), AWWA C600 (DIP), AWWA Manual M9 (Concrete Cylinder Pipe (CCP)) and manufacturer's recommendations, except as otherwise provided herein.

Fire service water mains shall be installed in accordance with NFPA 24, Chapter 8. The depth of cover over water pipes under roads and driveways shall be a minimum of 914 mm. The depth of cover over pipe in landscape and other areas shall be a minimum of 762 mm. Depth of grade shall be measured from the top of the pipe to finished grade. In addition, all mains shall be located a minimum distance of 3 meters horizontal and 0.3 meters vertical from sewer lines.

Tapping of Reinforced Concrete Pressure Pipe for flange outlets shall conform to AWWA M9.

Each pipe shall be handled into the trench carefully and in a workmanlike manner. The Contractor shall furnish all slings, straps, to permit satisfactory support of all parts of pipe when it is being handled. The Contractor shall take all necessary precautions to prevent movement of pipe in the event of the trench flooding. Any length of pipe broken or damaged due to mishandling or negligence on the part of the Contractor shall be replaced at no additional cost.

Ends of the pipe shall be thoroughly cleaned before joint is made. The surface of the joint shall be painted with required lubricant applied in accordance with manufacturer's directions. The lubricant shall be of the type recommended by pipe manufacturer. Pipes shall be jointed in strict accordance with pipe manufacturer's directions and workmen skilled in the installation of water mains shall accomplish the work.

No pipe or fittings shall be laid in water and trenches shall be in a reasonably dry condition when pipe is laid. At times when pipe laying is not in progress, the open pipe end shall be sealed with a tight cap or plug to prevent foreign matter from entering the pipe.

At locations where water main construction involves abrupt changes in pipe alignment, the changes shall be made with fittings as indicated on the contract drawings or ordered by the Engineer. Changes in pipe alignment shown at other locations shall be made with deflection of pipe joints and short lengths as required (DIP). Deflection of PVC pipe shall be made by deflection of the pipe itself, and no deflection across a joint will be allowed. Maximum allowable deflection angles shall be per pipe manufacturer's allowable less 1 degree of deflection angle.

All pipe filler pieces that must be cut on-site from full pipe lengths shall be cut and prepared in accordance with manufacturer's recommendations to provide a neat straight edge normal to the pipe length. Insofar as it is practical, the Contractor shall have on hand manufacturer supplied filler pieces (short length of pipe with plain ends) and short lengths of pipe to minimize on-site cutting of pipe.

Pipe sections shall be closely joined to form a smooth flowline. The Contractor shall check all joints with feeler ring gauge to insure proper positioning of rubber gaskets.

Pipes shall be mechanically restrained to the length specified on the plans. Thrust blocks shall only be used where specified. All fittings and appurtenances shall maintain a minimum of 5.5 meters of restrained pipe in all directions.

Except where electrical isolation is requested, all pipe joints shall provide electrical conductivity across the joint.

Metallic lines shall be exothermically welded and electrically continuous on DIP runs exceeding 30 meters, or as directed by the Engineer. Exothermic welds shall be against bare metal on both the bell and spigot ends of pipe. Care shall be taken when removing the pipe coating so that excess metal is not removed from the pipe. After a solid weld is made, re-coat the bare metal with two (2) coats of bituminastic paint and cover with a plastic protective cap. Concrete Cylinder pipe joints shall be bonded with bonding cables or bonding clips, which are welded to the joint rings on the exterior of the pipe in accordance with the manufacturers recommendations.

Corrosion test stations shall be installed on metallic lines at intervals not to exceed three hundred and five (305) meters, or as specified on the plans.

All underground metal (ductile iron pipe, valves, fittings, copper, brass, etc.) shall be wrapped in 0.2032 mm thickness (minimum) polyethylene encasement. The polyethylene shall be installed and repaired or replaced in accordance with AWWA C105.

The Contractor shall not proceed with covering the pipe with bedding and backfill until the Engineer has inspected the pipe.

A continuous number 12 insulated tracing wire shall be attached to mains, service lines, and appurtenances. The tracing wire shall be continuous between main line valve boxes and fire hydrants.

A three hundred and five (305) mm wide, blue plastic non-detectable water pipe marking tape shall be installed in all mainline trenches, 305mm to 610mm below finish grade.

### **Fittings**

Fittings of the proper type shall be furnished and installed wherever shown on the plans and as required by the Engineer. Mechanical joints shall be retained with retainer glands torqued to 101.7 Joules or as recommended by the manufacturer. In addition, all pipe fittings shall be mechanically restrained for the required length of pipe as indicated on the plans, or a minimum of 5.5 meters in all directions from the fitting.

### **Valves**

Valves shall be installed in the mains approximately where shown on the contract drawings. Each valve shall be installed with a gate box set vertically with top even with finished grade.

### **Abandoning Water Mains**

The existing water main pipe shall be cut using methods approved by the pipe manufacturer with the open pipe end prepared for installation of a watertight cap or plug. If the condition of the existing pipe is such that a cap or plug cannot be installed, then the Contractor shall install a flexible coupling and capped filler piece.

Where line valves will be abandoned the Contractor shall close all valves on abandoned water mains and remove the upper sections of their valve boxes. Where line valves are to be salvaged the Contractor shall remove the valve and valve box cover and cap or plug the pipe end connections.

### **Abandoning Water Services**

Existing water services noted on the contract drawings to be abandoned, or as directed by the Engineer to be abandoned, shall be disconnected at the water main (close corporation stop). Existing curb boxes shall be removed and the pipe ends shall be capped/plugged and anchored as deemed necessary.

### **Fire Hydrants**

Fire hydrants and appurtenances shall be installed as detailed on the contract drawings.

Fire hydrants shall be set straight and true on a firm base. Bury depths shall be as required on the contract drawings to maintain cover on the fire hydrant branch pipe.

Gate valves serving fire hydrant assemblies shall be located a minimum of 4.6 meters from the hydrant.

Where fire hydrants are to be salvaged the Contractor shall remove the entire fire hydrant assembly (hydrant, hydrant bury/extensions, and hydrant check valve) down to the branch line. The removed fire hydrant assembly shall be brushed, cleaned, transported to the location designated by the Local Water Authority and neatly stacked.

Branch valves for salvaged fire hydrant shall be salvaged or abandoned as indicated on the contract drawings.

Branch piping for salvaged fire hydrants shall be capped or plugged with a thrust block constructed behind each cap or plug on the branch pipe connected to water main that is not abandoned.

Fire hydrants, which have been removed from service or are not yet in service, shall be covered with burlap sack or other approved method to indicate "Out Of Service" condition until flushed and accepted for use by the Roseville Fire Department.

### **Deflection**

Wherever curves are negotiated by deflecting successive lengths of pipe, the deflection of each length of pipe shall not exceed the pipe manufacturers recommendation less 1 (one) degree.

### **Tapping Sleeve and Valve**

The Contractor shall coordinate the work with the local water authority.

Installation of materials, and tapping existing water main shall be accomplished using equipment and procedures recommended by the manufacturer.

The Contractor shall be responsible for preparing water mains for tapping whether the tapping connection is to be conducted by the Contractor or the local water authority.

The Contractor must excavate, expose and support the existing main(s) and attach the tapping sleeve and valve in accordance with the manufacturer's recommendations and to the satisfaction of the local water authority. All exposed surfaces that will come in contact with distribution water, such as the existing main fittings and equipment, shall be cleaned and sanitized by swabbing with chlorine solution prior to tapping.

The Contractor shall provide traffic control, trench sheeting/shoring, and lighting as necessary to support tapping operations.

### **Salvaged Materials**

Existing water system components indicated for salvage are to be removed by the Contractor by careful excavation around the item to be salvaged. The item shall be disconnected from the system as a unit or assembly. The item shall be brushed, cleaned, and transported to the designated salvage location. Salvaged materials that have been damaged due to reckless excavation, or handling shall be replaced in-kind by the Contractor.

### **Removed Materials**

Existing water system components indicated for removal shall be removed and properly disposed of by the Contractor. These materials shall become the property of the Contractor and shall be disposed of as provided in Section 7-1.13 of the Standard Specifications

### **Hydrostatic Testing**

Tests for leakage shall be conducted on all portions of completed water pipelines and appurtenances and all methods procedures for performing the testing of water mains shall be subject to the acceptance of the Engineer. Unless otherwise permitted, the testing shall be conducted with partial backfilling over the barrel of any new pipe, between new pipes, pipe fittings, valves and appurtenances of the section. Interiors of all pipes shall be cleaned of all dirt and foreign materials. The water pipelines may be tested in convenient sections acceptable to the Engineer.

Testing of water mains shall conform to the requirements of Section 4 of the AWWA C600, latest revision except as herein specified. The test pressure shall be a minimum of 1034kPa or 50 % above the working pressure, which ever is greater, for at least a three-hour duration. No detectable leakage is allowed.

Testing of water mains shall be performed by the Contractor at his expense as witnessed by the Engineer. Notarized records of the test results shall be submitted by the Contractor to the Engineer.

In case of leakage, the Contractor shall find and repair the leaks and the pipelines shall be retested repeatedly as necessary, at the expense of the Contractor.

### **Disinfecting Water Mains and Appurtenances**

All portions of completed water mains and appurtenances are to be disinfected before acceptance for operation by the local water authority.

Water mains shall be disinfected by the Contractor in conformance with AWWA Specification C601, latest revision. In particular, the Contractor shall follow all of the disinfection procedures of Section 9 – "Disinfection Procedures When Cutting Into Or Repairing Existing Mains" of AWWA Specification C601, unless otherwise directed by the Engineer. The Contractor shall be responsible for satisfactory disposal of all flushing water and chlorinated water at no additional expense to the Owner. The Contractor shall submit to the Engineer, the type of chlorine to be used, the disinfection experience of the workers, and the procedures and equipment to be used.

After the mains have been flushed clean, samples of the water contained in the mains shall be arranged by the Contractor to be taken for bacterial analysis by a State certified testing laboratory. Only after the analyses of the samples are acceptable to the local water authority shall the mains be made part of the system. In the event that positive reports of contamination are received, the Contractor shall flush and rechlorinate the mains as many times as may be necessary to obtain acceptable results. Samples shall be obtained from corporation cocks with copper gooseneck assemblies installed as directed along the



main to be disinfected, The taking of samples from hoses or fire hydrants will not be allowed. After samples have been collected, the gooseneck assembly may be removed and retained for future use.

The Contractor shall be warned that water main disinfection should be only accomplished by specially trained personnel and that the project's water mains are vital to the safety and well being of the municipality. State Health Department or other approval of the water main disinfection is to be received by the Contractor in a timely manner so as to quickly place the water mains into service.

The Contractor shall submit an affidavit of compliance to the Engineer. The affidavit of compliance shall be the bacteriological test results certifying the water samples from the water main to be free of coliform bacteria contamination.

The Contractor's workers who are responsible for the water main work should be aware of the potential health hazards with chlorine and should be trained to observe carefully the prescribed construction practices and disinfection procedures. The effectiveness of disinfection depends in large measure on maintaining clean pipes and avoiding major contamination.

The Contractor shall give thorough consideration to the impact of highly chlorinated water flushed to the receiving environment and follow all local regulations regarding its disposal. If there is any question that damage may be caused by a chlorinated water discharge (to fish life, plant life, physical installations, or other downstream water uses of any type), then an adequate amount of reducing agent should be applied by the Contractor to the water being disposed of in order to neutralize thoroughly the chlorine residual remaining in the water.

To prevent possible backflow or siphonage of contaminants into the water distribution system which is in service, the Contractor will be required to provide a reduced pressure backflow preventer on the temporary piping which is supplying water from the distribution system to the water main being treated and to provide such other safety and control measures as directed by the local water authority.

The Contractor shall be required to take samples and have testing performed by a certified testing laboratory for a minimum of the following items:

- Total Coliform
- Standard Plate Count
- Gross Hydrocarbons
- Volatile Organics

The Contractor shall take the required water samples after completion of flushing and disinfecting of the water main as directed by the Engineer. The Contractor shall be responsible for coordination and delivery of the samples to the certified testing laboratory. The Contractor shall also bear the costs of all water quality testing and analysis expenses by the certified laboratory.

#### **10-4.05 PAYMENT**

The contract lump sum price paid for water supply system shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in water supply system complete in place, including removal and abandoning existing facilities, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **SECTION 10-5. ELECTRICAL WORK (OPERATIONS BUILDING AND TUNNEL)**

#### **10-5.01 GENERAL**

The electrical work covered in this section shall include the furnishing of all labor, materials, equipment and services required to construct and install the complete electrical system for the operations building and the tunnel, including earthwork, removal, relocation and salvaging of material or equipment involved in the construction of the electrical system in accordance with the details shown on the plans, the provisions in the Standard Specifications and these special provisions.

The electrical work (operations building and tunnel) in general shall be the work described in the following subsections of this section:

- Basic materials and methods
- Service and distribution equipment
- Electrical equipment
- Lighting.(Building and Tunnel)
- Standby generator
- Uninterruptible power supply system
- Fire alarm and detection system
- Carbon monoxide (CO) monitoring system

Intrusion alarm system  
Pump control and monitoring system  
Supervisory control and data acquisition (SCADA) system  
Public safety radio system for tunnel  
Description of operations

## **SERVICE**

The Contractor shall furnish all material and perform all work necessary to complete the service installation or shall reimburse the Serving Utility therefore, all in accordance with the requirements of the Serving Utility.

The service installation shall conform to the requirements of the Serving Utility, in addition to the requirements of the plans and special provisions, the Contractor shall submit complete service details to the Serving Utility for approval prior to starting any work thereon.

The Contractor shall make all necessary arrangements with the Serving Utility in providing for metering equipment and/or for obtaining service. The Engineer will sign an application for service at such time as the Contractor may request, but the Contractor shall pay for all permits, fees, and other charges and for energy used until the time of acceptance of the contract.

## **SUBMITTALS**

Submittals shall be as specified in section 74-1.04 "Data to be Furnished" of the Standard Specifications. All dimensions illustrated on submittal drawings and all units of measurement shall be shown in the International System of Units (metric system). In addition, the proposed ladder logic diagram and user manual(s) including complete software and programming instructions for the Supervisory Control And Data Acquisition (SCADA) system and the programmable logic controller (PLC) shall be submitted for approval.

Project record drawings shall be submitted in accordance with the requirements specified under "Project Record Drawings," in Section 12-1, "General Requirements," of these special provisions.

As the work progresses, the Contractor shall maintain a record of all deviations in the work from that shown on the plans.

Final location of all underground work shall be recorded by depth from finished grade and by offset distance from permanent surface structures, for example: buildings, curbs, walks, etc. Equipment within the building and all concealed conduits shall be recorded by offset distances from building walls.

Prior to the completion of the contract, four (4) bound identified copies of the operation and maintenance instructions with parts lists for the equipment specified herein shall be delivered to the Engineer at the jobsite. The instructions and parts lists shall be in a bound manual form and shall be complete and adequate for the equipment installed. Inadequate or incomplete material will be returned. The Contractor shall resubmit adequate and complete manuals at no expense to the State.

Manuals shall be submitted for the following equipment:

Main Switchboard.  
Automatic Transfer Switch.  
Motor Control Center.  
Light Fixtures.  
Lighting Control System.  
Standby Generator.  
Uninterruptible Power Supply System.  
Fire Alarm System.  
Carbon Monoxide Monitoring System.  
Intrusion Alarm System.  
Pump Control and Monitoring System.  
SCADA System  
Programmable Logic Controller.  
Local Computer.  
Remote Computer.  
Radio Communication System.  
Public Safety Radio System.

## **QUALITY ASSURANCE**

**Codes and standards** -- All work performed and materials installed shall be in accordance with the National Electrical

Code; the California Building Standards Code, Title 24, Part 3, "California Electrical Code," and the California Code of Regulations, Title 8, Chapter 4, "Electrical Safety Orders," and all local ordinances.

**Warranties, guaranties, software licenses and instruction sheets** -- Manufacturer's warranties, guaranties, and software licenses furnished for materials used in the work and instruction sheets and parts lists supplied with materials shall be delivered to the Engineer at the jobsite prior to acceptance of the contract.

**Training** -- Training of State personnel in programming, connection, operation, trouble shooting, and maintenance of the lighting control system, CO monitoring system, fire alarm system, and SCADA system shall be provided. The training period shall be for a minimum of sixteen (16) hours and shall be conducted for not more than six State personnel at the job site or at a site mutually agreed upon by the Contractor and the Engineer. The trainer shall be an authorized representative of the equipment manufacturer, system integrator shall have complete knowledge of PLC and SCADA system installation and operation, and shall be qualified as a trainer.

All trainees shall be supplied with books, manuals, programmer or personal computer, software, and such other training material, guides and equipment, not mentioned, but required for a complete and thorough training course. Training shall include hands-on experience in programming techniques and operation.

**Manufacturer's and SCADA software technical support** -- The manufacturer of the SCADA software and programmable logic controller shall provide technical assistance and guidance in the operation, maintenance and trouble shooting of operational problems of the SCADA and PLC systems for one year following the acceptance of the Contract. The technical support shall be provided at no additional cost to the State.

Technical support shall be provided at the facility site by an authorized representative of the SCADA and PLC manufacturer and by a toll free telephone service to the manufacturer.

**Testing** -- After the electrical system installation work has been completed, the electrical system shall be tested in the presence of the Engineer to demonstrate that the electrical system functions properly. The testing shall include all the functions of the SCADA system and programmable logic controller. Testing of the SCADA system shall be at a remote site with an existing telephone service mutually agreed upon by the Contractor and the Engineer. The Contractor shall make necessary repairs, replacements, adjustments and retests at his expense.

**Field Testing** -- Prior to start of functional testing, the Contractor shall perform the following tests on all circuits, in the presence of the Engineer.

**Continuity** -- Each circuit shall be tested for continuity.

**Ground** -- Each circuit shall be tested for grounds.

**Insulation Resistance** -- An insulation resistance test at 500 V DC shall be made on each circuit between the circuit and a ground. The insulation resistance shall not be less than 10 MΩ on all circuits.

**Ground Resistance Testing** -- Each ground system installed will be tested with a ground resistance tester and the results turned over to the Engineer.

#### **10-5.02 BASIC MATERIALS AND METHODS**

This work shall consist of furnishing and installing conduits, conductors, fittings, and wiring devices in accordance with the details shown on the plans and these special provisions.

Conduits, conductors, fittings, and wiring devices shall include those accessories and appurtenances, not mentioned, that are required for the proper installation and operation of the electrical system.

#### **SUBMITTALS**

A list of materials and equipment to be installed, manufacturer's descriptive data, and such other data as may be requested by the Engineer shall be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials and equipment specified herein. Control and wiring diagrams, rough-in dimensions for fixtures, and component layout shall be included where applicable.

Manufacturer's descriptive data shall be submitted for equipment and devices.

## **MATERIALS**

**Hot-dip galvanized rigid steel conduit and fittings** -- Hot-dip galvanized rigid steel conduits and fittings shall be as specified in Section 86-2.05 "Signals, Lighting and Electrical Systems," of the Standard Specification.

Intermediate steel conduit will not be allowed.

**Electrical metallic tubing (EMT) and fittings** -- Electrical metallic tubing shall be formed of cold rolled strip steel, electrical resistance welded continuously along the longitudinal seam with zinc coating outside and enamel or lacquer coating inside.

Couplings shall be electroplated, rain and concrete tight, gland compression type, steel body couplings with malleable iron nuts.

Connectors shall be gland compression type, rain and concrete tight body connectors with male hub, malleable iron nut and insulated plastic throat.

**Liquid tight flexible metallic conduit and fittings** -- Liquid tight flexible metallic conduits and fittings shall be as specified in Section 86-2.05, "Signals, Lighting and Electrical Systems," of the Standard Specifications.

**Rigid non-metallic conduit and fittings** -- Rigid non-metallic conduit shall be Schedule 40, high impact, non conducting, self-extinguishing polyvinyl chloride (PVC) rigid non-metallic conduit for direct underground burial as specified in Section 86-2.05 "Signals, Lighting and Electrical Systems" of the Standard Specifications.

Fittings shall be PVC fittings, solvent cemented, as recommended by the conduit manufacturer.

**PVC coated conduit and fittings** -- PVC coated conduit and fittings shall be rigid steel conduit and fittings with an exterior factory coated 1.02 mm minimum thickness PVC coating complying with NEMA RN1. Factory coat conduit interior and threads with clear urethane.

**Cables** -- Cables shall be as follows:

1. Cable for the lighting control photo-diode sensor shall be 4#18 twisted shielded cable with a drain wire. Conductors in the cable shall be color-coded black, red, green, and yellow. Cable shall be suitable for a temperature range of -20°C to +80°C. Cable shall be rated for 300-volt, AC.
2. Cable for light fixture shall be 3#14 SO cord.
3. Cable for the CO monitoring sensor, shall be 2#18, twisted shielded pair cable with a drain wire. Cable shall be suitable for a temperature range of -20°C to +80°C. Cable shall be rated for 300-volt, AC.
4. Cable for the fire alarm linear heat detectors shall be two pairs, 2#16 twisted shielded pair cable with temperature rating of -6°C to +20°C and shall be California Fire Marshal rated. The cable shall be rated for 300-volt, AC.
5. Coaxial cable for closed circuit television system shall be type RG-11U cable with #14 AWG solid conductor. Cable shall have 75 ohm nominal impedance.
6. Three twisted shielded conductor pairs, minimum #22 AWG solid bare copper, high-density polyethylene insulated conductors rated 300-volt with an overall polyethylene jacket rated for direct burial.
7. Coaxial cable for radio transmission, unless otherwise shown on the plans, shall be a single length of 12.7mm low loss foam dielectric type that is weatherproof and suitable for direct exterior exposure.

**Conductors** -- Conductors shall be stranded copper wire.

All conductors shall be rated for 600-volt operation, Conductors No. 16 AWG and smaller shall be rated for 300-volt, AC operation.

Conductor insulation types unless otherwise shown or specified, shall be as follows:

1. Conductors across hinges of control panel enclosures shall be Type MTW.
2. Conductors No. 2 AWG and smaller shall be Type THWN.
3. Conductors No. 1 AWG and larger shall be Type XHHW or shall be Type THHN in dry locations and Type THWN in wet locations.

**Wire connections and devices** -- Wire connections and devices shall be pressure or compression type, except that connectors for No. 10 AWG and smaller conductors in dry locations may be preinsulated spring-pressure type.

**Outlet, device and junction boxes** -- Unless otherwise shown or specified, boxes inside the operations building only, shall be galvanized steel boxes with knock-outs and shall be the size and configuration best suited to the application

indicated on the plans. Minimum size of outlet, receptacle, switch or junction boxes shall be 102mm square by 38mm deep.

Multiple switches shall be installed in standard gang boxes, unless otherwise specified or shown on the plans.

All junction boxes inside the tunnel shall be NEMA-4 boxes with covers. The size and configuration of the boxes shall be best suited to the application shown on the plans. Junction boxes shall contain 600-volt, 30-ampere rated power distribution type terminal blocks with equipment grounding terminal, insulating cover and provision for multi-tap. Terminal blocks shall be suitable to accept conductors up to #4 AWG. 305mm x 305mm x 152mm and larger NEMA-4 junction boxes shall be of non-metallic type boxes.

Surface-mounted galvanized sheet steel boxes shall have galvanized steel covers with metal screws.

Cast iron junction boxes shall have cast metal covers with gaskets.

Weatherproof switch and receptacle boxes shall have gasketed covers with gasketed hinged flaps to cover switches and receptacles.

Sectional device plates will not be permitted.

**Underground pull boxes** -- Underground pull boxes shall be as specified in Section 86-2.06 of the Standard Specifications.

Telephone pull box shall be as required by Telephone Company.

**PB-1, PB-1A, PB-2, and PB-2A** -- Pull boxes shall be 1 m W x 1.5 m L x 1 m D. Provide traffic rated pull boxes with barrier to isolate power and control circuits from instrumentation circuits.

**Ground fault circuit interrupter receptacles, (GFCI)** -- Ground fault circuit interrupter receptacles shall be NEMA Type 5-20R, feed-through type, ivory color, 3-wire, 20-ampere, 125-volt AC, grounding type, specification grade duplex receptacle with ground fault interruption. Receptacle shall detect and trip at current leakage of 5 milliampere and shall have front mounted test and reset buttons.

**Duplex receptacles** -- Duplex receptacles shall be NEMA Type 5-20R, 3-wire, 20-ampere, 125-volt AC, grounding type, ivory color, specification grade duplex receptacle suitable for wiring with stranded conductors.

**Light switches** -- Switches shall be 20-ampere, 120/277-volt AC, specification grade, ivory color switch. Switch shall be suitable for wiring with stranded conductors.

**Pumping plant receptacles (PR-1 and PR-2)** -- Receptacles shall be single plug, 20-ampere, 125-volt, AC, listed and labeled "Receptacle Suitable For Class 1 Division 2 Locations".

**Pull ropes** -- Pull ropes shall be nylon or polypropylene with a minimum tensile strength of 2224 Newton.

**Anchorage devices** -- Anchorage devices shall be corrosion resistant, toggle bolts, wood screws, bolts, machine screws, studs, expansion shields, and expansion anchors and inserts.

**Electrical supporting devices** -- Electrical supporting devices shall be one hole conduit clamps with clamp backs, hot-dipped galvanized, malleable cast iron.

Construction channel shall be 41mm x 41mm, 12-gage galvanized steel channel with 13mm diameter bolt holes, 38mm on center in the base of the channel.

**Ground rods** -- Ground rods shall be a 19mm (minimum) galvanized or copper clad steel rod, 3 m long.

**Telephone outlet boxes** -- Telephone outlet boxes shall be 102mm square boxes and cover plates with modular type telephone outlet.

**Disconnect switch** -- Disconnect switch shall be NEMA heavy-duty Type HD. Indoor switches shall be NEMA Type 1 enclosure. Outdoor switches or where indicated to be weatherproof shall be NEMA Type 3R raintight enclosures. DS shall have quick-make and quick-break operating handle and provisions for padlocking in the "OFF" position. DS shall have interlock to prevent unauthorized opening of the hinged cover when the switch is in the "ON" position and an interlock to prevent closing the switch mechanism with the hinged cover open.

**DS-1 and DS-2** -- DS-1 and DS-2 disconnect switches shall be same as above, except switches shall be NEMA Type 1.

**Nameplates** -Nameplates shall be laminated phenolic plastic with white core and black front and back. Nameplate inscription shall be in capital letters etched through the outer layer of the nameplate material.

Inscriptions on nameplates shall be as shown on the plans. Nameplates shall be mounted with self-tapping cadmium plated screws or nickel plated bolts except the nameplates mounted on the back of an enclosure cover shall be attached with a strong adhesive.

## INSTALLATION

**Conduit** -- Unless otherwise shown, all conduit shall be threaded, hot-dip galvanized inside and outside, rigid steel conduit with threaded steel or malleable iron fittings.

Electrical metallic tubing may only be used for exposed work indoors inside the operations building above the switch height.

Unless otherwise specified or shown on the plans, liquid-tight flexible metal conduit shall be used to connect suspended lighting fixtures, motors, and other equipment.

Rigid non-metallic conduit shall be used at the locations shown on the plans for direct underground burial outside the building foundation.

Conduit trade sizes are shown on the plans. No deviation from the conduit size shown on the plans will be permitted without written permission from the Engineer.

Conduit shall be concealed unless otherwise shown on the plans.

Conduits shall be tightly covered and well protected during construction using metallic bushings and bushing "pennies" to seal open ends.

Rigid non-metallic conduit bends of 30 degrees or greater shall be factory-made long radius sweeps. Bends less than 30 degrees shall be made using an approved heat box.

A pull rope shall be installed in all empty conduits. At least 610mm of pull rope shall be doubled back into the conduit at each termination.

Locations of conduit runs shall be planned in advance of the installation and coordinated with the ductwork, plumbing, ceiling and wall construction in the same areas and shall not unnecessarily cross other conduits or pipe, nor prevent removal of ceiling tiles or panels, nor block access to mechanical or electrical equipment.

Where practical, conduits shall be installed in groups in parallel, vertical or horizontal runs and at elevations that avoid unnecessary offsets.

Exposed conduit shall be installed parallel and at right angles to the building or tunnel structures lines.

Conduits shall not be placed closer than 305mm from a parallel hot water or steam pipe or 76mm from such lines crossing perpendicular to the runs.

All raceway systems shall be secured to the building or tunnel structures using specified fasteners, clamps and hangers.

Single conduit runs shall be supported by using one hole malleable iron strap installed with "clamp backs" to space conduit off the surface.

Multiple conduit runs shall be supported with construction channel secured to the building structure. Conduits shall be fastened to construction channel with channel compatible pipe clamps.

Raceways of different types shall be joined using approved couplings or transition fittings. Conduit terminations at power or communication gutter shall be made by using weatherproof hubs.

Conduits shall be securely fastened to cabinets and boxes using two locknuts and an insulating bushing. Grounding bushings with bonding jumpers shall be installed on all conduits terminating at concentric knockouts and on all conduits containing service conductors, grounding electrode conductors, or conductors feeding separate buildings.

Conduit terminations at exposed weatherproof enclosures and cast outlet boxes shall be made watertight using connectors or hubs.

Expansion couplings shall be installed where conduit crosses a building separation or structure expansion joint.

All floor and wall penetrations shall be sealed watertight.

**Conductor and cable installation** -- Conductors shall not be installed in conduit until all work of any nature that may cause injury is completed. Care shall be taken in pulling conductors that insulation is not damaged. An approved non-petroleum base and insulating type pulling compound shall be used as needed.

All cables shall be installed and tested in accordance with manufacturer's recommendations.

Splices and joints shall be insulated with insulation equivalent to that of the conductor.

Provide 152mm of slack at each outlet and device connection. If the outlet or device is not at the end of a run of wire, connection shall be made with correctly colored pigtails tapped to the runs with splices as specified herein.

Branch circuit conductors in panelboards shall be neatly trained along a path from the breaker terminals to their exit point. The conductors shall have ample length to transverse the path without strain, but shall not be so long as to require coiling, doubling back, or cramming. The path shall transverse the panelboard gutter spaces without entering a gutter

containing service conductors and, unless otherwise shown on the plans, without entering the gutter space of any panelboard feeder.

All pressure type connectors and lugs shall be re-tightened after the initial set.  
Splices in underground pull boxes and similar locations shall be made watertight.

### CONDUCTOR IDENTIFICATION

In addition to color coding required by the National Electrical Code, all phase conductors shall be color coded by continuously colored insulation. Feeders and branch circuits No. 6 AWG or larger may be color coded by continuously colored insulation or by colored tape at each connection and where accessible. Phase conductor color coding shall be as follows:

SYSTEM	COLOR CODE
120/240V-Single phase	Black, blue
120/240V-Three phase	Black, orange, blue
120/208V-Three phase	Black, red, blue
480/277V-Three phase	Brown, orange, yellow

Where more than one branch circuit enters or leaves a conduit, panel, switchboard, motor control center, or junction box, each conductor shall be identified by its panelboard and circuit number. All control conductors shall be identified at each termination with the wire numbers shown on the plans. Identification shall be made with one of the following:

1. Self-laminating wrap-around type, printable, transparent, permanent heat bonding type thermoplastic film markers.
2. Close fitting machine imprinted polyvinyl chloride sleeves with black indented legend and a chevron cut for alignment of two or more sleeves.
3. Pre-printed, white, heat-shrinkable tubing.

Each terminal block shall have a molded marking strip attached with screws. The identifying numbers of the terminating conductors, as shown on the plans or on the submittal drawings, shall be engraved in the marking strip.

**Outlet, device and junction box installation --** Where one or more threaded steel conduits are required to connect to an outlet, device, or junction box, the box shall be a cast metal box with threaded hubs. Weatherproof outlet, device and junction boxes shall have cast metal covers with gaskets.

Outlet, device, and junction boxes shall be installed at the locations and elevations shown on the plans or specified herein. Adjustments to locations may be made as required by structural conditions and to suit coordination requirements of other trades. No unused openings shall be left in any box. Knockout seals shall be installed as required to close openings.

**Pull box installation --** Electrical pull box covers or lids shall be marked "ELECTRICAL." Telephone service pull box covers or lids shall have plain, unmarked covers.

The bottom of pull boxes shall be bedded in 152mm of clean, crushed rock or gravel and shall be grouted prior to installation of conductors. Grout shall be sloped to a one-inch drain hole. Conduit shall be sealed in place with grout.

Top of pull boxes shall be flush with surrounding grade or top of curb. In unpaved areas where pull box is not immediately adjacent to and protected by a concrete foundation, pole or other protective construction, the top of pull box shall be set at plus 30mm above surrounding grade. Pull boxes shown on the plans in the vicinity of curbs shall be placed adjacent to the back of curb, Pull boxes shown on the plans adjacent to lighting standards shall be placed on the side of foundation facing away from traffic.

**Ground rod --** The ground rod shall be driven vertically until the top is 152mm above the surrounding surface. When vertical penetration of the ground rod cannot be obtained, an equivalent horizontal grounding system, approved by the Engineer, shall be installed.

**Anchorage --** Hangers, brackets, conduit straps, supports, and electrical equipment shall be rigidly and securely fastened to surfaces by means of toggle bolts on hollow masonry; expansion shields and machine screws, or expansion anchors and studs or standard preset inserts on concrete or solid masonry; machine screws or bolts on metal surfaces; and wood or lag screws on wood construction.

Anchorage devices shall be installed in accordance with the anchorage manufacturer's recommendations.

**Mounting heights --** Electrical system components shall be mounted at the following mounting heights, unless

otherwise shown on the plans. The mounting height dimensions shall be measured above the finished floor to the bottom of the device or component.

Wall switches	1 m
Convenience outlets	1220 mm
Telephone outlets	1220 mm

### 10-5.03 SERVICE AND DISTRIBUTION EQUIPMENT

This work shall consist of furnishing and installing service and distribution equipment in accordance with the requirements of the serving utilities, the details shown on the plans and these special provisions.

#### SUBMITTALS

**Installation details** -- The Contractor shall submit complete service installation details to the Serving Utility for approval. Prior to submitting to the Serving Utility, the Contractor shall have said drawings reviewed and stamped "APPROVED" by the Engineer. Submittals shall be approved by the Serving Utility prior to commencing work.

**Product data** -- A list of materials and equipment to be installed, manufacturer's descriptive data, and such other data as may be requested by the Engineer shall be submitted for approval.

Prototype test certification and the manufacturer's data shall include complete description, performance data and installation instructions for the materials and equipment specified herein. Schematic, wiring and interconnecting diagrams, and dimension drawings shall be submitted for approval. The interconnecting diagrams shall identify by terminal number each required interconnections between the switchboard, generator and automatic transfer switch.

Manufacturer's descriptive data shall be submitted for the following:

- Main switchboard.
- Circuit breakers.
- Automatic transfer switch.

#### MATERIALS

**Main switchboard** -- Main switchboard shall be a group of a vertical sections suitable for housing incoming service conductors, utility instruments and meters, power monitor, main and standby generator circuit breakers, and automatic transfer switch. Sections shall be bolted together to form a rigid, free standing complete assembly as shown on the plans. Main switchboard shall be indoor Type NEMA-12 enclosure, suitable for 480/277-volt, 600-ampere, 3-phase, and 4-wire service.

The main switchboard bus bars shall be of copper with silver at all joints. Each phase bus shall be identified with colored paint. Bus bars shall be mounted on insulator supports of high impact, high quality insulation material and adequately braced to withstand fault current of 50,000 symmetrical ampere at 480-volt, AC.

All sections shall be bussed to accept devices in marked spaces.

The main bus rating shall be not less than the frame rating of the largest overcurrent device connected.

The ground bus shall be continuous through all sections and shall be connected to all section structures by welding or bolting. The capacity of the ground bus shall be not less than 50 percent of the main phase bussing.

The neutral bus shall be provided through all sections with the capacity equal to the capacity of the main phase bussing.

Pull section and metering compartment shall be sized and arranged to comply with the Serving Utility's requirements. Instrument transformers and KWH meter shall be provided and installed by the Utility and the enclosure arrangement shall be approved by the Utility before submitting shop drawings to the Engineer for approval.

**Circuit breakers (CB1 and CB2)** -- Circuit breakers shall be 3-pole, 600-ampere frame, 600-ampere trip, 600-volt circuit breaker with a shunt trip.

The interrupting capacity of the main circuit breakers shall be 50,000 RMS symmetrical current at 480-volt, AC.

**Power monitor** -- Power monitor shall be a microprocessor based monitoring system with instrumentation, transformers, and other accessories required to provide complete electrical metering of the power system. Power monitor shall have the capability to interface with the SCADA system.

Power monitor shall provide the following direct reading metered values:

1. AC Ampere each phase.
2. AC-voltage between phases and each phase to neutral.



3. Watts, VARs, Power Factor, Frequency, Watt-hours.

Power monitor shall have the following field settable functions with alarm outputs:

1. Phase loss when less than 50% of nominal live-voltage is detected.
2. Phase reversal.
3. Overvoltage - range from 105 to 140 percent (5 percent increments).

Delay with adjustable range of 0 to 8 sec to allow existence of overvoltage or undervoltage before an alarm occurs.

Power monitor shall have the following interface:

1. Loss of utility power output relay contact.

**Automatic transfer switch (ATS)** -- The automatic transfer switch shall consist of a microprocessor based, fully programmable, solid state controller, selector switches, pilot lights, auxiliary contacts, and any other accessories required but not mentioned for the complete automatic operation of the transfer switch. The transfer switch, related accessories, controller, switches and pilot lights shall be mounted in the switchboard where shown on the plans.

The automatic transfer switch shall be 3-pole, 4-wire, 480-volt, 60 Hz, and 600-ampere rated transfer switch with a withstand capacity of 65,000 RMS symmetrical ampere at 480-volt, AC.

The transfer switch unit shall be electrically operated and mechanically held. The electrical operator shall be momentarily energized, single-solenoid type mechanism. The switch shall be mechanically interlocked to ensure only one of the two possible positions, NORMAL or STANDBY. The switch shall be positively locked and unaffected by momentary power outages to maintain a constant contact pressure.

All main contacts shall have silver composition and must be accessible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. The automatic transfer switch shall also be manually operable with a manual operating handle. The handle shall permit the operator to manually stop the contacts at any point throughout their entire travel to inspect and service the contacts when required.

The neutral conductor terminal bus shall be rated for AL-CU pressure connectors.

The automatic transfer switch and accessories shall conform to the requirements of:

- A. UL 1008: Standard for Automatic Transfer Switches
- B. NFPA 110: Emergency and Standby Power Systems
- C. IEEE Standard 448: IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
- D. NEMA Standard ICS2-447: AC Automatic Transfer Switches

**ATS controller** -- The controller shall be microprocessor based, programmable, and fully solid-state controller design to control the operation of the automatic transfer switches as described in this section.

The controller shall have wire harness with a keyed disconnect plug for making and breaking connections with the transfer switch mechanism. The controller shall be enclosed in a plastic protective cover. Sensing and control logic shall be provided on plug-in printed circuit boards. Interfacing relays shall be industrial grade plug-in type with dust covers.

The controller shall meet or exceed the requirements for Electromagnetic Compatibility (EMC) as follows:

1. Electrostatic Discharge (ESD) IEC 801-2
2. Electrical Fast Transients (EFT) IEC 801-4 and NEMA ICS-1-109
3. Surge Withstand - IEC 801-5 and IEEE 472 (ANSI C37 90A)
4. Electromagnetic Interference - Mil Std 461, Class 3

The controller shall monitor the-voltage and frequency of both the input power sources to the transfer switch. The pick-up-voltage shall be adjustable from 85 percent to 100 percent and the dropout-voltage shall be adjustable from 75 percent to 98 percent of the pick-up setting. The repetition accuracy of all settings shall be  $\pm 2$  percent or better over an operating temperature range of -20°C to 70°C. The-voltage and frequency setting shall be field adjustable in 1% increments.

The automatic transfer switch shall have the following features and options provided in the control:

1. Time delay to override momentary normal source outages and delay all transfer and engine starting signals, adjustable from 0 to 6 seconds.
2. Time delay on transfer to emergency, adjustable from 0 to 5 minutes for controlled timing of transfer of loads to emergency.

3. Time delay on retransfer to normal, adjustable from 0 to 30 minutes. Time delay shall be automatically bypassed if emergency source fails and normal source is acceptable.
4. Time delay on shutdown of engine generator for cool down, adjustable from 0 to 60 minutes.
5. A set of DPDT contacts rated 10-amps, 32-volt DC for low-voltage engine start signals. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output, and run for the duration of the cool down setting, regardless of whether the normal source switch to select whether the load should be transferred to the emergency generator if the normal source restores before the generator is ready to accept the load.
6. A momentary-type test switch to simulate a normal source failure.
7. Terminals for a remote contact which opens to signal the ATS to transfer to emergency and for remote contacts which open to inhibit transfer to emergency and/or retransfer to normal.
8. Terminals to signal the actual availability of the normal and emergency sources, as determined by the-voltage sensing pickup and dropout settings for each source.
9. Auxiliary contacts, rated 10-amps, 480-volt, AC consisting of one contact, closed when the ATS is connected for normal source and one contact closed, when the ATS is connected to emergency source.
10. Indicating lights, one to indicate when the ATS is connected to normal source and one to indicate when the ATS is connected to emergency source.
11. An engine generator exercising timer, including a selector switch to select exercise with or without load transfer. The exerciser shall be programmable to enable exercise for 1 minute to 24 hours per day in 1 minute increments for 0 to 7 days per week.
12. An in-phase monitor, built into the controls. The monitor shall control transfer so that load inrush currents do not exceed normal starting currents, and shall not require external control of power sources.
13. A full duplex RS-422 interface shall be built into the ATS control panel to enable digital communications with remotely located annunciators and/or network supervisors.

**ATS test and certification** -- The ATS shall be tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the operating transfer time,-voltage, frequency and time delay settings are in compliance with the specification requirements.

The switch shall be subjected to a dielectric strength test per NEMA Standard ICS 1-109.21.

Upon request, the manufacturer shall provide a certificate of compliance with all of the requirements of this specification including compliance with the above codes and standards, and withstand and closing ratings. The certification shall identify, by serial number(s), the equipment involved. No exceptions to the specifications, other than those stipulated at the time of the submittal, shall be included in the certification.

**Utility transformer pad** -- The contractor shall provide and install a precast pad unit to support the utility transformer. The precast concrete pad shall be subject to the approval of the Serving Utility.

## **EXECUTION**

Installation of service and distribution equipment shall be in accordance with the requirements of the manufacturer and Serving Utility as shown on the approved installation details and plans.

### **10-5.04 ELECTRICAL EQUIPMENT**

This work shall consist of furnishing and installing electrical equipment and related accessories in accordance with the details shown or, the plans and these special provisions.

## **SUBMITTALS**

A list of materials and equipment to be installed, manufacturer's descriptive data, and such other data as may be requested by the Engineer shall be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials and equipment specified herein. Control and wiring diagrams and component layouts shall be included where applicable.

Manufacturer's descriptive data shall be submitted for all equipment and devices.

## **MATERIALS**

**Motor control center** -- MCC shall consist of enclosed vertical sections joined together to form a rigid, free standing assembly. The construction of the MCC shall meet the requirements set forth by Underwriters' Laboratories UL 845 and

NEMA ICS-2-322 and be UL listed. The MCC shall be in accordance with NEMA standards for Type 1 gasketed enclosure.

The MCC shall be suitable for operation with 480-volt, 3-phase, 4-wire plus ground, 60 Hertz service. MCC shall have a minimum fault interrupting capacity of 22,000-ampere (symmetrical) at 480-volt, AC.

Vertical sections shall support the vertical buses, combination starter units, covers, and doors, and shall be designed to allow for easy rearrangement of units. Vertical sections shall have structural supporting members formed of a minimum 2.66mm thick hot rolled steel. Each section shall be maximum 2286mm high and shall have 4.55mm thick steel, 76mm high removable lifting angle and two 38mm high base channels. Base channels shall be provided with holes to permit bolting the MCC to the floor.

Vertical sections, except control section, shall be designed to accommodate plug-on units in front-of-board construction. Vertical sections housing plug-on units shall be 508mm wide and shall be 508mm deep, control section shall be 762mm wide and shall be 508mm deep. Removable blank plates shall cover all unused unit mounting spaces. Blank plates shall be flanged on all four sides and shall be mounted with captive screws.

Vertical sections shall be mounted with both horizontal and vertical wireways. Sufficient clearances shall be provided in the horizontal wireway so that no restriction is encountered in running wires from the vertical to horizontal wireway.

Horizontal wireways shall be provided in the top and bottom of each vertical section and shall be arranged to provide full length of continuity throughout the entire assembly. The top horizontal wireway shall have a cross sectional area of not less than 12,903 square mm with openings between sections of not less than 7420 square mm. The bottom horizontal wireway shall extend through the length and depth of the vertical sections and shall also be provided with an opening of not less than 7420 square mm to allow for full length continuity throughout the entire assembly. The bottom horizontal wireway shall have a cross sectional area of not less than 5968 square mm. Covers for all wireways shall be equipped with captive screws.

A vertical wire trough shall be located on the right hand side of each vertical section and shall extend from the top horizontal wireway to the bottom of the available unit mounting space. Each vertical wire trough shall have a cross sectional area of not less than 12,258 square mm. A separately hinged door having captive type screws shall cover the vertical wire trough to provide easy access to control wiring without disturbing control units.

Reusable wire ties shall be furnished in each vertical wire trough for the purpose of grouping and securely holding wires in place. All wireways shall be isolated from the bus bars.

Main three-conductor horizontal bus and power terminal block for connection shall be provided. Horizontal bus bars shall be rated 600-ampere continuous and be mounted edgewise and supported by insulated bus supports of high strength glass reinforced alkyd material.

For distribution of power from the main horizontal bus to each unit compartment, a three-phase vertical bus shall be provided. The main vertical buses shall be made of aluminum and the entire length shall be electrolytically plated. The rating of the vertical buses shall be minimum 300-ampere continuous current rating and shall be in accordance with UL, ANSI, and NEMA standards.

Each unit shall have a door securely mounted with concealed type hinges which shall allow the door to swing open a minimum of 112 degrees. Doors shall be fastened to the structure so that they may remain in place when a unit is withdrawn and may be closed to cover the unit space when the unit has been temporarily removed. Doors shall be held closed with captive screws which engage self-aligning cage nuts. Each starter unit door shall house an external low-profile overload reset button for resetting the overload relay.

Each plug-on unit shall be supported and guided by tilt and lift-out removable pan.

An external operator handle shall be supplied for each switch or circuit breaker. The operator handle shall be color coded to display red in the "ON" position and black in the "OFF" position. The operator handle shall have a conventional up-down motion and shall be designed so that the down position will indicate the unit is "OFF". For safety it shall be possible to lock this handle in the "OFF" position with up to three padlocks. The operator handle shall be interlocked with the unit door to prevent switching to the "ON" position while the unit door is open. A defeater mechanism shall be provided for the purpose of defeating this interlock.

A schematic diagram and a ladder diagram of the control system under transparent protective cover shall be provided with the MCC.

The MCC wiring shall be NEMA Class 2, Type B-T wiring.

**Motor starters** -- NEMA size as shown on the plans, NEMA rated, 3-pole, line-voltage combination starter and motor circuit protector mounted in the MCC as shown on the plans. Starter shall have 120-volt coil, double-break silver contacts, and 3 manual-reset, non-adjustable thermal overloads set to trip between 115 and 125 percent of full load motor current, as quoted on the nameplate by the motor manufacturer. Overload reset shall be externally operable. Starter shall have one normally-close and one normally-open auxiliary contacts.

**(MS-1, MS-2, MS-3, and MS-4)** – In addition to the above requirement, provide a 2-speed, 2-winding motor starter

capable of operating a fan motor in the forward and reverse directions.

**Phase failure relay disconnect** -- Three-pole, 600-volt, AC, 100-ampere frame, 15-ampere trip, molded case circuit breaker mounted in MCC as shown on the plans. The interrupting capacity of the breaker shall be 65,000-ampere (symmetrical) at 480-volt, AC.

**Phase failure relay (PFR)** -- 480-volt, AC, socket mounted, adjustable, automatic reset, -voltage sensing phase failure relay with single-pole, double-throw, 5-ampere, 120-volt contacts. Relay shall be capable of sensing phase loss, phase unbalance and phase reversal and shall have a LED indicating the relay is energized. Relay shall be mounted in the MCC where shown on the plans.

**Seal failure relays (SFR1 and SFR2)** -- Seal failure relay shall be as shown on the plans and as recommended by the pump manufacturer. The seal failure relay, complete with separate pump leak indicator light, sensor probe continuity test push-button and test indicator light, shall be a factory assembled unit mounted inside the MCC where shown on the plans. Relay shall include one normally-open and one normally-closed contact rated for 120-volt, AC.

**Current switches (CS1 and CS2)** -- Self-powered, solid state, AC current sensing switch mounted in each motor starter and elsewhere as shown on the plans. Switch shall have a single-pole, normally-open contact rated one-ampere at 240-volt, AC. Current sensing level shall be chosen between a low range of one to 15 amperes and a high range of 15 to 300-ampere. Switch shall have a thru-hole of 14mm minimum diameter for sensing the AC current.

**Time meters (TM)** -- 120-volt, 60-Hz, non-resettable running time meter with 0 to 99,999.9 hours range. Meter shall be mounted on the MCC door as shown on the plans.

**Selector switches (SS1 and SS2)** -- 30.5mm, NEMA Type 4, single-pole, 2-position maintained, 10-ampere, 120-volt rotary switch mounted on the MCC door as shown on the plans. Switch contacts shall have an inductive pilot duty rating of 60-ampere (make), 6-ampere (break) and 10-ampere (continuous) at 120-volt and 35 percent power factor. Selector switch shall have legend plate marked "HAND-AUTO".

**Push Buttons (PB)** -- Heavy duty, general purpose, 30.5mm push button with one normally open, momentary contact. Contact shall have an inductive pilot duty rating of 60-ampere (make), 6-ampere (break) and 10-ampere (continuous) at 120-volt and 35 percent power factor. Push button shall have legend plate marked "START".

**Pilot Lights (PL)** -- 30.5mm, NEMA Type 4, panel mounted, 120-volt, AC, high visibility light emitting diode (LED) type lamp with colored plastic lens and screw cap. Lights shall be mounted on MCC door as shown on the plans. Plastic lens color as shown on the plans.

**Control Relays (CR)** -- 120-volt, AC, general purpose relay with 3-pole, double-throw, 10-ampere contacts. Relay shall be enclosed in a clear plastic with 11-pin plug base. Socket for the relay shall be barrier type, 11-contacts relay socket with 10-ampere contacts and screw terminals.

**Terminal Blocks (TB)** -- 30-ampere, 600-volt, NEMA rated, molded plastic with two or more terminals and two or more mounting holes in each cast block or channel mounted type (DIN rail). The molded plastic shall have a high resistance to heat, moisture, mechanical shock and electric potential and shall have a smooth even finish. Terminal blocks shall have tubular, high-pressure clamp connectors.

Each terminal block or row of blocks shall have a molded marking strip attached with screws or a computer printed plastic label securely fastened to the blocks. The identifying numbers of the terminating conductors, as shown on the plans or on the approved submittal drawings, shall be engraved in the marking strip or permanently printed on the plastic label. The marking strip shall be laminated phenolic plastic with white core and black front and back.

**Coils** -- All coils of relays, starters and other operating equipment shall have magnet coils wound for an operating range having a mean equal to the actual voltage to be applied.

**Warning plates** -- Warning plates shall be laminated phenolic plastic with white core and red front and back. Warning plate inscription shall be in 6mm high capital letters etched through the outer layer of the warning plate material.

Each pump motor starter shall have a warning plate with the inscription "WARNING: MOTOR DISCONNECT DOES NOT OPEN CONTROL CIRCUIT".

**Control Center Cabinet (CC)** -- Control center shall consist of seven enclosed vertical sections bolted together to form a rigid, free standing assembly. The construction of the control center shall meet the requirements set forth by Underwriter's Laboratories publication UL-845, NEMA publication number ICSA-2-322 for "Motor Control Centers". Each section shall be 508mm wide and 508mm deep. The control center enclosure shall be in accordance with NEMA standards for Type 12 enclosure.

The control center shall be suitable for operation with 480-volt, 3-phase, 4-wire, 60 Hz service. The control center wiring shall be NEMA Class 2, Type B.

All metal structural parts shall be completely painted using an electrode position process so that interior and exterior surfaces as well as bolted joints have a complete finish coat on and between them. Paint shall be Acrylic Melamine Electrode position Baked Enamel, ANSI 49, medium gray.

The Electrical equipment shall be as follows:

1. Tunnel lighting control as described under "Lighting" of these special provisions.
2. Security alarm system as described under "Intrusion Alarm System" of these special provisions.
3. Carbon monoxide monitoring system as described under "Carbon Monoxide Monitoring System" of these special provisions.
4. Extinguishable message sign control.
5. Panelboards A, B, C, and E.
6. Fire alarm system as described under "Fire Alarm And Detection System" of these special provisions.

**Panelboard A** -- Panelboard A shall be 3-phase, 4-wire, 480/277-volt, AC panelboard with 225-ampere main circuit breaker, insulated groundable neutral, and molded case branch circuit breakers as shown on the plans.

**Panelboard B** -- Panelboard B shall be 3-phase, 4-wire, 480/277-volt, AC panelboard with 100-ampere main circuit breaker, insulated groundable neutral, and molded case branch circuit breakers as shown on the plans.

**Panelboard C** -- Panelboard C shall be 1-phase, 3-wire, 120/240-volt, AC panelboard with 100-ampere main circuit breaker, insulated groundable neutral, and molded case branch circuit breakers as shown on the plans.

**Panelboard D** -- Panelboard D shall be 1-phase, 3-wire, 120/240-volt, AC panelboard with 100-ampere main circuit breaker, insulated groundable neutral, and molded case branch circuit breakers as shown on the plans.

**Panelboard E** -- Panelboard E shall be 3-phase, 4-wire, 480/277-volt, AC panelboard with 100-ampere main circuit breaker, insulated groundable neutral, and molded case branch circuit breakers as shown on the plans.

**Remote Panel** -- Remote panel shall be a heavy duty, 10 gauge steel, NEMA 4 type enclosure with hinged, pad-lockable door. Enclosure shall be provided with steel mounting panel and stand off for mounting electrical equipment. Enclosure shall be 762 mm W x 914.4 mm H x 508 mm D.

**Roseville Fire Department Remote Control Panel** -- Roseville Fire Department remote control panel shall be a heavy duty, 10 gauge steel, NEMA 4 type enclosure with hinged, pad-lockable door. Enclosure shall be provided with steel mounting panel and swing-out panel for mounting electrical equipment and devices. Enclosure shall be 457 mm W x 1219 mm H x 305 mm D.

**Transformer** -- Transformer shall be dry type. Transformer shall have two 2 1/2 percent full capacity taps above and four 2 1/2 percent full capacity taps below normal primary-voltage. Transformer shall be in accordance with ANSI C89.2, NEMA ST-20, and UL Standard 506.

**(XFMR-Card XFMR-D)** -- Transformer card D shall be 1-phase, 480-volt AC primary, 120/240-volt AC secondary, 15-kVA rated. Transformer shall be enclosed in a NEMA 1 enclosure.

**(XFMR-MCC)** -- Transformer MCC shall be 1-phase, 480-volt AC primary, 120/240-volt AC secondary, 5-kVA rated. Transformer shall be open type installed within MCC.

**Current transformer** -- Current transformer shall be 600-volt, AC rated transformer with 50:5 ampere ratio and accuracy of 2% at full rated load.

**Voltmeter** -- Voltmeter shall be door mounted, AC, with full scale range of 0 to 300 volt and  $\pm 2$  percent accuracy. Voltmeter shall be approximately 4 1/2 inch square with 250-degree scale.

**Voltmeter selector switches** -- Voltmeter selector switches shall be door mounted, 4 position switch with handle and capable of sending signal to voltmeter to detect the line voltage. The switch shall have legend plates with the following signs:

Position 1: phase A  
Position 2: phase B  
Position 3: phase C  
Position 4: Off

**Toggle switches** -- Toggle switches shall be single pole single throw toggle switch rated 6-ampere at 120-volt.

## **EXECUTION**

**Motor control center installation** -- The Contractor shall provide the Engineer with an order of work for installation of the MCC. Set MCC plumb and symmetrical with building lines. MCC shall be mounted on channel and anchored to the concrete slab with expansion anchors and bolts. The MCC shall be shimmed as required to make each section level. Train interior wiring as specified under "Conductor and Cable Installation" in "Basic Materials and Methods" of these special provisions. Touch-up paint any marks, blemishes, or other finish damage suffered during installation. Replace doors or trim exhibiting dents, bends, warps or poor fit which may impede ready access, security or integrity.

Mounting height shall be 1.8m to the highest circuit breaker handle, measured above the finished floor.

Where "Space" is indicated on the motor control center elevation on the plans, mounting brackets and other hardware shall be furnished and installed for future starters and breakers.

**Panelboard installation** -- Where "Space" is indicated on the panelboard schedule on the plans, branch connectors, mounting brackets and other hardware shall be furnished and installed for future breakers.

A typewritten directory under transparent protective cover shall be provided and set in metal frame inside each panelboard cabinet door. Directory panel designation for each circuit breaker shall include complete information concerning equipment controlled, including room number or area designated on the plans.

**Transformer installation** -- Connect primary to minimum value taps during construction period and prior to initial building start-up. Make-voltage readings and adjust tap connections to nominal-voltage during final construction review and prior to building occupancy.

**Equipment identification** -- Equipment shall be identified with nameplates fastened with self-tapping, cadmium-plated screws or nickel-plated bolts.

Nameplate inscriptions shall be as shown on the plans.

## **10-5.05 LIGHTING**

This work shall consist of furnishing, installing and connecting all lighting equipment in accordance with the details shown on the plans and these special provisions.

### **MATERIALS**

**Lighting fixture lamps** -- Lighting fixture lamps shall be type and size as shown on the plans. Lamps shall be General Electric, Philips, Sylvania, or equal.

**Lighting fixtures** -- Lighting fixtures shall be as shown on the plans and as specified herein. Outdoor fixtures shall be listed and labeled "Fixture Suitable For Wet Locations". Pumping plant fixtures shall be listed and labeled "Fixture Suitable For Class 1 Division 2 Locations".

### **BUILDING LIGHTING**

**A** -- Industrial fluorescent fixture with 2-32 watt lamps, electronic ballast, formed steel, white polyester painted reflector with 10% uplight. The fixture shall be Thomas Industries Day-Brite, Catalog No. 1F232-PP-1/2-EB; Lithonia, Catalog No. AF10-2-32-120-P0; or equal.

**B** -- Outdoor, wall mounted, 35-watt, 120-volt high pressure sodium cut-off type fixture with integral ballast and photocell. The fixture shall be Lithonia Type TWAC; Thomas Industries Day-Brite Type Directolite Wall Light; or equal.

**C** -- Adjustable dual head emergency fixture with sealed nickel cadmium battery and die formed steel housing. The fixture shall be Thomas Industries mcPhilben Type ES series; Lithonia Type Titan; or equal.

**D** -- Outdoor, pole mounted, 26-watt, 120-volt, AC, compact fluorescent light with red lens and protective guard.

**RL** -- Explosion proof fluorescent fixture with 2-40 watt lamps, electronic ballast, and white polyester painted reflector. The fixture shall be Appleton Electric Company ARS series; Crouse-Hinds FVN series; or equal.

**SL** -- Explosion proof incandescent fixture with 1-300 watt lamp, glass globe, and dome polyester reflector. The fixture shall be Appleton Electric Company ASB series; Crouse-Hinds EVJ series; or equal.

**Ballasts** -- Ballasts shall be energy efficient ballasts conforming to ANSI standards. Ballasts shall be furnished with CBM/ETL label attached.

Indoor type ballasts for fluorescent lamps shall have sound rating A, except ballasts for high output lamps shall have sound rating B.

## **TUNNEL LIGHTING**

**H1** -- The fixture shall be a heavy-duty die-cast aluminum one-piece housing with a zinc-chromate sealer and powder gray paint finish. The optical assembly shall be asymmetrical light distribution – negative contrast (Counter-beam Lighting) type; sealed and attached to the door. Door shall be of the same material as housing and is attached with two integrated c-hinges on one side and one over-center latch on the opposite side. The fixture shall have approximate dimensions of 457mmW x 597mmH x 333mmD.

The fixture shall be surface mounted on a flat steel plate supplied with the fixture by the fixture manufacturer. Mount H1 fixture to the tunnel ceiling as shown on the plans.

The fixture shall be capable of tool-free access to lamp and ballast for maintenance. The fixture assembly shall be capable of withstanding water spray of 10 gallons per minute at 100psi.

**H2** -- H2 fixture shall be the same as H1 except H2 fixture's optical assembly shall be symmetrical distribution with a 60-degree and 70-degree tilt angle. Mount H2 fixture to tunnel walls as shown on the plans.

**Optical assembly** -- The optical assembly shall be fully enclosed and silicon gasketed. It shall be a single piece, formed aluminum reflector. The optical assembly shall contain a horizontally mounted heavy-duty mogul base socket with nickel-plated tempered brass split-shell lamp grips and free-floating.

**Ballast** -- The ballast shall be mounted on a ballast tray and secured with a wire bail latch or quarter-turn fasteners for quick no-tool replacement. The ballast shall be a high power factor ballast to provide power factor of 90 percent or better, voltage within tolerance from 35 percent to 10 percent while maintaining lamp arc; lamp wattage regulation of 0.8% for each 1% change of line-voltage up to  $\pm 10$  percent. The ballast shall reliably start and operate the HPS lamp in ambient temperatures down to  $-18^{\circ}\text{C}$ . The fixture shall be 277-volt, AC and wattage as shown on the plans.

**Photometric performance** -- Manufacturer shall provide photometric analyses verifying the following criterion for lighting in the tunnel's threshold zone:

Maintained Day Time Lighting level	Luminance ( $\text{cd}/\text{m}^2$ )
Average	230
Uniformity Average/Min	1:1
Maintained Night Time Lighting level	Luminance ( $\text{cd}/\text{m}^2$ )
Minimum	2.5
Uniformity Average/Min	2:1

**H3** -- Strobing compact fluorescent fixture with 1-26 watt lamp, red lens with protective guard.

## **TUNNEL LIGHTING CONTROL**

Tunnel lighting control shall consist of a photo diode sensor, lighting controller, operator interface, transformer, lighting contactors, selector switches, timers, pilot lights, control relays and accessories not mentioned but that are required for the complete automatic operation of the tunnel lighting.

Tunnel lighting level status shall be monitored by SCADA system.

**Photo diode sensor** -- The photo diode sensor shall be a Class 2, low-voltage, ambient light sensor designed to interface directly with the analog input of the controller. The sensor shall supply an analog-voltage signal to the controller system proportional to the light measured. The sensor shall be capable of a fully adjustable response in the range between 5 and 1000 cd/m<sup>2</sup> with a ±1% accuracy at 21°C.

The sensor sensitivity adjustment shall be remote at the controller. The sensor housing shall be suitable for outdoor and shall be constructed from flame retardant plastic complying with UL 94 HB standards. The sensor shall have a hood over the aperture to shield the sensor from direct sunlight. The sensor circuitry shall be completely encased in an optically clear epoxy resin. Sensors shall mount to a standard threaded 13mm conduit or fit a 13mm knockout.

**Lighting controller** -- The lighting controller shall be microprocessor based, programmable, low-voltage (24-volt AC), and completely solid-state type lighting controller specifically designed for tunnel lighting control. The lighting controller shall receive analog-voltage output of the photo-diode sensor to control independently three output circuits in response to the available day light. The controller shall be programmed for the following control mode:

Control Setpoint	Ambient Light Switching Level	Condition	Mode
Level 1	50 cd/m <sup>2</sup>	Dim Daylight	Contrast
Level 2	230 cd/m <sup>2</sup>	Daylight	Contrast

The controller shall have photo-diode adapter at the photo-diode sensor input side to provide linear calibration of the photodiode sensor between 2 percent and 100 percent of the sensor range. The sensor input shall have an adjustable time delay (30 sec to 7 min) with manual override (for start-up and testing) to avoid false intermittent switching. Each individual set point shall have a fixed 10 percent dead band. In addition, the controller shall have photo-diode simulator to provide precise set point measurements and switching levels. Simulator shall have calibration diode, voltmeter jacks and two position selector switch to change between sensor and calibration signal input. Each output circuit of the controller must be rated at 3-ampere minimum at 120-volt, AC. Controller shall display individual circuit status, power on, and sensor condition. Lighting controller shall have timer for each output circuit to provide an adjustable minimum ON/OFF time for each circuit. The adjustable range shall be between 5 minutes to 4 hours.

**Operator interface** -- Operator interface shall be a solid-state interface module with 2-line LCD display, numeric keypad with arrow keys, and HAND/OFF/AUTO selector switches for each individual switching level. In addition to displaying and controlling controller's status, the interface shall also allow viewing and editing of the operating parameters. Each channel shall have the following:

Parameter	Range
Mode	Night or Contrast
Time Delay	0-99 Minutes
Low Setpoint	0-500 cd/m <sup>2</sup>
High Setpoint	0-500 cd/m <sup>2</sup>
Hold On Timer	0-240 Minutes

Interface module shall also provide provisions for scaling the photo diode sensor. Precise scaling of the light input shall be measured and displayed in engineering unit (foot-candles).

**Transformer** -- Transformer shall be appropriately fused, 120/24 V, AC, control transformer of the suitable size to power the lighting controller and related accessories.

**Lighting contactor, (1LC1 through 3LC4)** -- Lighting contactor shall be mechanically held and electrically operated, 12-pole, 480-volt, lighting contactor with 120-volt AC coil and 30-ampere, double-break, silver alloy main contacts and one 10-ampere rated SPDT, auxiliary contact.

**Selector switch, (SS1, SS2)** -- Selector switch shall be rotary action, double-pole, 4-position, 10-ampere, 120-volt switch. Switch contacts shall have an inductive pilot duty rating of 60-ampere (make), 6-ampere (break) and 10-ampere



(continuous) at 120-volt and 35 percent power factor. Selector switch shall have legend plate with marking as shown on the plans.

**Light control transformer, (TR)** -- Light Control transformer shall be double-wound, dry and open type, 100 VA, 60 HZ transformer with 120-volt primary and 24-volt secondary. The transformer shall have primary and secondary fuses.

**Terminal block, (TB)** -- Terminal block shall be 30-ampere, 600-volt, molded plastic with two or more mounting holes and two or more terminals in each cast block. The molded plastic shall have a high resistance to heat, moisture, mechanical shock, and electrical potential and shall have a smooth even finish. Each block shall have a molded marking strip attached with screws. Terminal blocks shall have tubular, high pressure clamp connectors. Terminal block shall accept wires range from #14 to #4.

**Switch, (SW)** -- Switch shall be shall be toggle type, 120-volt, 10-ampere, AC, single-pole, switch.

**Indicating lights, (1IL1 through 4IL3)** -- Indicating lights shall be panel mounting push to test indicating lights with amber lens with screw cap and 24-volt direct incandescent replacement LED type lamp.

**Control relay, (CR1, CR2, CR3)** -- Control relay shall be 120-volt, AC, heavy duty, modular construction, convertible contact cartridge relay with 12-pole, 10 ampere, 120-volt, AC contacts.

**Timer, (TM1, TM2)** -- Timer shall be 120-volt, two circuit, solid-state programmable timer switch with power on-off and manual override switches. Each timer circuit switch shall be able to program for a minimum of 3 independent schedules for any day or days of the week in addition to being able to skip selected days. Timer shall also have the ability to move schedules from one day to another day at the push of a button. Timer shall have 5 years lithium type battery for retaining program during power interruptions.

## EXECUTION

**Lighting fixtures** -- Lighting fixtures shall be mounted securely in accordance with the manufacturer's recommendations. Mounting methods shall be suitable for the particular type of ceiling or support at each location.

The Contractor shall provide all supports, hangers, spacers, channels, fasteners and other hardware necessary to support the fixtures.

Fixtures shall be set at the mounting heights shown on the plans, except heights shown shall be adjusted to meet conditions.

**Ballast** -- All fluorescent fixtures shall be equipped with high power factor ballast suitable for the line-voltage and for the type, size and number of lamps required by fixture.

All ballast used in unheated areas inside the building shall be 0°F rated ballast or less.

**Tunnel lighting fixtures** -- Tunnel lighting fixtures shall be surface-mounted on the fixture mounting plate as shown on the plans and as recommended by the fixture manufacturer. Prior to fixture mounting, mounting plate shall be mounted securely on the tunnel soffit surface in accordance with the manufacturer's recommendations.

The Contractor shall provide all supports, hangers, fasteners and other hardware necessary to support the fixtures.

Prior to lighting fixture installation, all roadway striping for the tunnel portion of the road must be complete and in place; then the work of lighting fixtures layout and installation shall begin.

Tunnel lighting fixtures shall be set at the spacing and relative location of each row of fixtures with respect to the travel way as shown on the plans.

**Photo-diode sensor** -- Photo-diode sensor shall be surface-mounted on the exit portal of the tunnel as shown on the Plans and as recommended by the photo-diode sensor manufacturer. Prior to installation, the contractor shall submit installation details of the photo-diode sensor to the Engineer for approval and only then the installation work shall begin.

**Lighting system start-up** -- A factory authorized Engineer shall be available for consultation during installation of the tunnel lighting control system. In addition, factory authorized technician/engineer shall be present at the start-up and commissioning of the lighting control system. Before start-up the factory technician must perform the following:

- Sensor calibration.
- Loop checkout.

Proper displaying of the data.  
System simulation.  
Any adjustments required.

## **10-5.06 STANDBY GENERATOR**

### **GENERAL**

This work shall consist of furnishing and installing one standby generator in accordance with the details shown on the plans and these special provisions.

The standby generator shall include engine, generator, circuit breakers, starting batteries, generator control panel, battery charger, protective housing, top mounted exhaust silencer, base mounted diesel fuel tank, warning sign, battery hydrometer with storage container, battery filler, distilled water, anchoring devices, vibration isolators, and such other miscellaneous accessories, not mentioned, which are required for the complete installation and proper operation of the standby generator.

The standby generator assembly shall be factory assembled and mounted on a steel base with vibration isolators.

### **SUBMITTAL**

Prototype test certification and the manufacturer's descriptive information on all standard and optional accessories, schematic wiring diagrams, interconnection diagrams, and dimension drawings shall be submitted for approval. The interconnection diagrams shall identify by terminal number each required interconnection between the generator and the automatic transfer switch, as specified elsewhere in these special provisions.

### **MATERIALS**

**Engine--** The engine shall be 4-stroke cycle, full compression ignition diesel No. 2 fuel type, liquid cooled, and designed for continuous operation.

The engine's continuous duty rated brake horsepower shall be ample to drive the generator and connected normal accessories at the rated speed and unity power factor at 100 percent of the rated load with an ambient temperature of 35°C at 152.4m feet above sea level.

The engine shall be capable of rated output when operating on commercially available grade No. 2-D diesel fuel. The crankshaft shall be drilled for full pressure lubrication to all bearings. All crankshaft bearing surfaces shall be hardened. The crankshaft shall have one more main bearing than there are number of cylinders. The intake and exhaust valves and valve seats shall be heat resistant alloy steel. The exposed surfaces of the engine shall be finished with one coat of primer and 2 coats of an industrial paint suitable for the intended use.

The engine shall be equipped with the following accessories:

**Diesel fuel filter system --** The diesel fuel filter system shall consist of a primary fuel filter capable of removing particles of 50 microns and larger, and a secondary filter capable of removing particles of 25 microns and larger. Each filter shall be a spin-on, replaceable unit, designed for diesel fuel filtration and water separation. Filters shall be located for easy service access.

**Oil filter system --** The pressurized lubricating oil system shall have a full flow filter system, consisting of a strainer with openings not to exceed 0.64mm in greatest dimension, and a separate, cleanable or replaceable filter capable of removing particles of 25 microns and larger.

**Air filter system --** The air intake shall be provided with a dry type air filter of adequate capacity to effectively remove dirt and abrasives from the combustion air. The dry type filter shall be designed to allow for easy removal and replacement of filter element. The filter shall be equipped with service indicators to indicate necessary replacement.

**Engine governor --** The governor shall be a gear driven mechanical type providing a 5 percent speed regulation from no load to full load and provide +0.5 percent steady state frequency regulation.

**Engine cooling --** The engine shall be equipped with an engine driven radiator cooling system. The radiator shall be capable of cooling the engine while operating at 100 percent rated continuous load in 52°C maximum ambient temperature. Fan shall be push type.

**Engine preheater --** The engine shall be equipped with a 120-volt, 1000-watt electric water jacket heater. The heater shall be thermostatically controlled to maintain engine coolant at the proper temperature to meet the start up requirement of

NFPA-99 standard. Electric water heater shall be cutoff from the power supply during all times engine is up and running. The required circuitry for proper operation shall be provided. The thermostat shall be adjustable between 38°C and 49°C.

**Engine starter** -- The engine shall be provided with a 12-volt heavy duty positive engagement solenoid shift starting motor. The drive mechanism for engaging the starting motor with the engine flywheel shall engage and release without binding.

**Safety controls** -- The engine shall be provided with automatic controls that shuts down engine operation when low lubricating oil pressure, high water temperature or overspeed conditions occur. The values at which the low lubricating oil pressure, high jacket water temperature and overspeed controls operate to shut down engine operation, shall be as recommended by the engine manufacturer.

Overcrank safety controls shall be provided as specified in these special provisions.

**Engine instrumentation** -- Engine instruments shall be mounted in the engine-generator control panel. Engine instruments shall include the following:

- a. Lubricating oil pressure gage.
- b. Water temperature gage.
- c. Engine hour meter (totalizing mechanism of 9,999 hours).

**Exhaust system** -- The exhaust system shall consist of a muffler and flexible connection. A rain cap shall be installed on the discharge end of the exhaust pipe. Minimum size shall be equal to the exhaust outlet of the muffler.

The muffler shall be a residential type, sized to meet or exceed the engine requirements. The muffler shall be provided with a drain, flange connection and companion flanges.

The flexible connection shall be bellows type, not less than 305mm in length and installed between the engine exhaust and the Schedule 40 black steel exhaust pipe. The flexible connection shall be constructed of Type 321 stainless steel and shall be provided with flanged ends for connection to the engine and black steel exhaust pipe.

Exhaust system shall be installed with complete exhaust thermal blanket supplied by the engine generator manufacturer. An approved thimble must be used where exhaust system passes through the roof.

**Diesel fuel tank** -- The engine shall be equipped with a base mounted diesel fuel tank of not less than 681-liter capacity, supplied by the generator manufacturer. The fuel tank shall be double wall and shall be complete with fuel level indicator, leak sensor, flexible fuel lines, vent pipe, and fill devices.

**Starting batteries** -- Storage batteries for engine starting and other requirements shall be sufficient in number, and shall be 6-cell, heavy duty, lead-acid type. Total battery capacity shall be a minimum of 90 ampere-hours at the 20-hour rate. Batteries shall be mounted in corrosion resistant battery racks located within the skid base and shall be provided with battery cables of sufficient length to connect to the DC apparatus.

**Battery charger** -- The battery charger shall be of the dual rate type and shall be mounted in the engine-generator control panel. The battery charger shall be provided with the following features:

1. DC ammeter.
2. Dual fusing for AC input and DC output.
3. Automatic DC-voltage regulation.
4. Automatic load regulation.
5. Compensation taps for setting the charger for average AC line and battery conditions.
6. DC cranking circuit disconnect relay.

**Generator**-- The generator shall be a brushless type, single bearing, self-aligning, continuous duty, synchronous type. The insulation shall be NEMA Class F or better.

The generator shall be rated, 480/277-volt, 3-phase, 4-wire, 60 Hz, 1800 RPM, 0.8 power factor, 70°C rise over a 40°C ambient temperature. Minimum generator size shall be 500kW. The sustained RMS-voltage dip shall not be greater than 10% of rated-voltage when full load at rated power factor is applied to the generator. The engine-generator shall be capable of starting and running the following loads in the cumulative sequence listed. In addition, the engine-generator shall be sized such that the transient-voltage dip at starting inrush conditions for each cumulative step shall not be greater than 10% of rated-voltage when starting and running the following loads in the sequence listed. Maximum-voltage dip (as defined by

NEMA MG-1-1998, Section 32.18.2.2) shall be 10%.

Load	kW	Starting Method	Code Letter
a. Auxiliary Loads	13.5 kW	Full-voltage	
b. Pump #1	22.4 kW	Full-voltage	
c. Pump #2	22.4 kW	Full-voltage	
d. VF-1	18.6 kW	Full-voltage	
e. VF-2	18.6 kW	Full-voltage	
f. VF-3	18.6 kW	Full-voltage	
g. VF-4	18.6 kW	Full-voltage	
h. EF-1	0.6 kW	Full-voltage	
. Tunnel lights	112 kW	Full-voltage	

The generator shall have the following capabilities:

1. Steady state-voltage regulation at full rated load shall be within plus or minus one percent.
2. Voltage regulation shall be within plus or minus 2 percent of rated steady state-voltage from no load to full load.
3. Voltage recovery shall be within 2 percent of nominal rated-voltage within 5 seconds, after the rated load is applied or removed in one-step.

**Engine generator control panel** -- A completely wired and assembled engine-generator control panel shall be mounted on the engine-generator unit. The panel and its components shall comply with all applicable NEMA standards for industrial type controls, and shall be fully enclosed and vibration isolated. The panel shall include the following switches and instruments exposed on the front of the control panel:

1. AC ammeter.
2. AC-voltmeter.
3. Three-position combination ammeter-voltmeter-phase selector switch.
4. Frequency meter.
5. Manual reset generator exciter circuit breaker with thermal magnetic trips.
6. Battery charger DC ammeter.
7. Manual "START-STOP" switch.
8. Indicating lights to show cause of emergency shutdown.
9. Emergency "STOP" switch.
10. Voltage adjust rheostat.
11. Engine oil pressure gage.
12. Engine running time meter.
13. Engine water temperature gage.

Equipment or devices to be mounted within the engine-generator control panel shall include the following:

1. Battery charger.
2. Automatic-voltage regulator.
3. Automatic starting controls.
4. Radio interference suppression
5. Transformers, relays and other equipment required for proper operation.
6. Output relay contacts for "Generator Ready" and "Generator Running".

Equipment mounted in the control panel shall be arranged for easy service access. Output relay contacts shall be 120-volt, AC, with 1 NO and 1 NC contacts rated 3-ampere at 120-volt.

**Overcranking protection** -- Upon failure of primary power, the engine shall be automatically cranked for 20 seconds or until it starts, whichever is shorter. If the engine fails to start within 20 seconds, further attempts to start shall be prevented by a manually reset lockout device. Overcranking default condition shall be indicated by a pilot light.

**Leak detection panel** -- Leak detection panel shall be a solid state control panel with LED indications and audible

alarm. Panel shall be UL listed and rated for 120-volt, AC input. Panel shall have SPDT output contacts for remote monitoring.

**Miscellaneous accessories** -- A galvanized sheet metal duct shall be fabricated and installed between the radiator and the exhaust louvers.

The generator main power disconnect shall be 480-volt, 3-pole, 1000-ampere trip molded case, thermal-magnetic, circuit breaker and shall be mounted in a NEMA Type-12 enclosure on the side of the generator housing. The adjustable magnetic trip shall be set for 1000-ampere. The interrupting capacity of the circuit breaker shall be 30,000-ampere at 480-volt, AC.

A warning sign shall be mounted on engine generator set at a location approved by the Engineer. The sign shall be sheet steel, not less than 1.2mm thick (18-gage) with a baked enamel coating. The sign shall have a red background and white letters not less than 38mm in height. The sign inscription shall read as follows:

DANGER  
AUTOMATIC  
MAY START AT ANY TIME

A commercial quality battery hydrometer with plastic type storage container, and a commercial quality 3.8 liters battery filler with filler hose and one-gallon of distilled water, shall be furnished and installed adjacent to the battery location. The body of the battery filler shall be clearly marked "DISTILLED WATER" in letters not less than 13mm in height.

## **EXECUTION**

Equipment shall be installed in accordance with the requirements in NFPA 37, NFPA 211, the latest edition of the Uniform Mechanical Code, the manufacturer recommendations and the requirements specified in these Special Provisions.

Each engine-generator shall be installed on top of a separate base mounted fuel tank as shown on the plans.

Anchoring devices shall be as recommended by the engine -generator manufacturer and shall be installed to fasten each fuel tank securely to the concrete slab.

Vibration isolators shall be installed between each engine base and the base mounted fuel tank. The type and size of the isolators shall be as recommended by the engine-generator manufacturer.

**Generator testing** -- Each engine-generator power generating system shall be tested at completion of installation and adjustments.

All necessary materials, test equipment and instruments, and labor required for the tests shall be furnished. The Contractor shall notify the Engineer not less than 3 working days in advance of testing. Testing shall be performed in the presence of the Engineer.

Each engine-generator power generating system shall be tested for compliance with the conditions shown on the plans and the requirements specified in these special provisions.

Tests shall utilize a resistive load bank. All transient requirements shall be demonstrated by means of recording instruments. All engine safety shutdown devices shall be demonstrated.

A battery and starter test shall consist of 30 seconds of continuous cold with out engine start, followed by immediately by a normal engine start without excessive starter laboring.

A 4-hour heat run shall be conducted at 100 percent of generator rated full load capacity.

## **10-5.07 UNINTERRUPTIBLE POWER SUPPLY SYSTEM (UPS)**

### **GENERAL**

This work shall consists of furnishing and installing a complete operable Uninterruptible Power Supply System in accordance with the details shown on the plans and these special provisions. The system shall include all materials, whether mentioned or not, that are necessary for a complete and operational UPS System.

The UPS System shall automatically maintain AC power within specified tolerances to the load, without interruption, during failure or deterioration of the normal power source. Continuity of power to the load shall be maintained during power interruptions with the uninterruptible power system supplied by battery power for the specified time or until the normal power supply is restored.

The UPS System shall be a minimum 12 pulse continuous duty, 480/277-volt (input and output-voltages), 3-phase, 4-wire, on line power conditioner system, capable of instantly supplying at least a 50 kVA load at 0.8 power factor for a minimum of 7 minutes when the primary input power is lost during brownout or blackout.

The UPS shall require no more than 3 to 1 generator to UPS ratio for operation (a generator of three times of the UPS capacity can start up and come on line without being overloaded by the UPS). The UPS overall efficiency shall not be less than 92%.

The UPS shall consist of input isolation transformer, rectifier/charger unit with input filters, inverter, display and controls, static transfer switch, maintenance bypass switch, and battery power rack all housed in a freestanding, NEMA Type 12 cabinet with front access, caster and leveling feet.

The UPS shall be UL and/or CSA listed.

The UPS shall be provided with a separate Maintenance Bypass Cabinet with circuit breakers and rotary switch to bypass UPS as shown on the plans.

### **SUBMITTAL**

Manufacturer's descriptive information, including catalog cuts of cabinet dimensions, component descriptions, wiring diagrams, front panel detail (including monitoring equipment arrangement), interior detail (including battery mounting), and other pertinent data, and installation instructions shall be submitted for approval.

Manufacturer's installation instructions shall include descriptions of required installation equipment, procedures to be followed and precautions to be observed.

### **MATERIALS**

**Input isolation transformer** -- The input isolation transformer shall be a delta-to-wye configuration single point ground transformer sized appropriately to provide common mode noise attenuation for all system operating modes, including while on bypass.

**Rectifier/charger** -- The rectifier/charger shall be the solid-state equipment with necessary controls to convert incoming AC power to regulated DC power for input to the inverter and for battery charging. The rectifier/charger shall be a phase-controlled, solid-state SCR type with constant current limiting control circuitry to limit input current to 125% of the full input current rating. The rectifier/charger shall have the following features:

1. The rectifier/charger shall employ input filter to reduce reflected input current distortion to 10% of THD at full load with nominal input-voltage.
2. The rectifier/charger shall contain a timed walk-in circuit that causes the unit to gradually assume the load over a 20-second time interval after input-voltage is applied. Walk-in time shall be field selectable for 5 or 20 seconds.
3. The rectifier/charger shall have an output filter to minimize ripple-voltage into the battery.

Upon restoration of the utility AC power, after a utility AC power outage and prior to a uninterruptible power system automatic end-of-discharge shutdown, the rectifier/charger shall automatically restart, walk-in, and gradually assume the inverter and battery recharge loads. In addition to supplying power for the inverter load, the rectifier/charger shall be capable of producing battery charging current sufficient to replace 95% of the battery discharge power within ten (10) times the discharge time. After the battery is recharged, the rectifier/charger shall maintain the battery at full charge until the next emergency operation.

**Inverter** -- The inverter shall be a solid-state with necessary controls to convert DC power from the rectifier/charger or battery to regulated AC power for supporting the critical load. The inverter shall have a transistorized, phase-controlled, pulse width modulated (PWM) design capable of providing the specified AC output. The inverter shall be capable of supplying current at rated-voltage for overloads, exceeding 100% and up to 150% of full load current for 30 seconds. A status indicator and audible alarm shall indicate overload operation. The UPS System shall transfer the load to bypass when overload capacity is exceeded. For greater currents or longer time duration, the inverter shall have electronic current-limiting protection to prevent damage to components. The inverter shall be self-protecting against any magnitude of connected output overload. Inverter control logic shall sense and disconnect the inverter from the critical AC load without the requirement to clear protective fuses. Inverter shall have the following features:

1. A dry type power transformer sized accordingly shall be provided for the inverter AC output.
2. Inverter shall have electronic controls to regulate each phase output-voltage to be within the specified-voltage unbalance or phase displacement due to unbalance loading and removal of the inverter from the critical load. Simultaneously for turning on the static transfer switch to maintain continuous power to the critical load.
3. The inverter shall be able to operate from the rectifier/charger with the battery disconnected.
4. DC overvoltage shutdown.
5. DC undervoltage warning (adjustable from 1 to 99 minutes).
6. DC undervoltage shutdown (end of discharge) protection.

The inverter shall have manual controls to adjust the output-voltage to  $\pm 5\%$  of the nominal value.

The inverter shall have temperature compensated output frequency control to hold the inverter output frequency to  $\pm 0.1\%$  for steady state and transient conditions. Drift shall not exceed 0.1% during a 24-hour period. Total frequency deviation, including short time fluctuations and drift, shall not exceed 0.1% from the rated frequency.

**Display and controls** -- The UPS System shall be provided with a microprocessor based unit status display and controls section designed for convenient and reliable operation. A system power flow diagram shall be provided as part of the monitoring and controls sections which depicts a single-line diagram of the uninterruptible power system. Illuminated visual indicators shall be of the long-life light-emitting diode (LED) type. All of the operator controls and monitors shall be located on the front of the UPS cabinet. The monitoring functions such as metering, status and alarms shall be displayed on a alphanumeric LCD display. The UPS monitoring system shall have the following controls and display:

1. Menu-driven display with text format.
2. Real time clock (time and date).
3. Alarm history with time and date stamp.
4. Battery back-up memory.
5. Input AC-voltage line-to-line and line-to-neutral for each phase.
6. Input AC current for each phase.
7. Input frequency.
8. Battery-voltage.
9. Battery charge/discharge current.
10. Output AC-voltage line-to-line and line-to-neutral for each phase.
11. Output AC current for each phase.
12. Output frequency.
13. Percent of rated load being supplied by the UPS System.
14. Battery time left during battery operation.
15. Input power out of tolerance.
16. Input phase rotation incorrect.
17. Incorrect input frequency.
18. Charger in reduced current mode.
19. Battery charger problem.
20. Battery failed test.
21. Low battery warning (adjustable 1 to 99 minutes).
22. Low battery shutdown.
23. DC bus overvoltage.
24. Bypass frequency out of range.
25. Load transfer to bypass.
26. Excessive retransfers attempted.
27. Static switch failure.
28. UPS output not synchronized to input power.
29. Input power single phased.
30. Input-voltage sensor failed.
31. Inverter leg over current in X-phase.
32. Output undervoltage.
33. Output overvoltage.
34. Output overcurrent.
35. System output overloaded.
36. Load transferred to bypass due to overload.
37. Overload shutdown.
38. Control error.
39. Critical power supply failure.
40. Load transferred due to internal protection.
41. External shutdown (remote EPO activated).
42. Fan failure.
43. Overtemperature shutdown impending.
44. Overtemperature shutdown.
45. Normal operation.

46. Load on maintenance bypass.
47. Load on uninterruptible power system.
48. Load on static bypass.
49. System shutdown.
50. UPS on battery.

UPS System start-up, shutdown, and maintenance bypass operations shall be accomplished by a single rotary control switch. An advisory display and menu-driven user prompts shall be provided to guide the operator through system operation without the use of additional manuals. Pushbuttons shall be provided to display the status of the UPS system and to test and reset visual and audible alarms.

A mimic panel shall be provided to depict a single line diagram of the uninterruptible power system. Indicating lights shall be integrated within the single line diagram to illustrate the status of the UPS System. Two LEDs located on the diagram shall indicate whether UPS input and/or output power is present. The diagram shall be color coded with the positions of the rotary control switch for visual confirmation of the UPS operating mode.

The UPS System shall be provided with a menu driven on-line battery test feature to ensure the capability of the battery to supply power to the inverter while the load is supplied power in the normal mode. During the battery test failure, the system shall automatically do the following:

- Transfer the load to bypass.
- Restart the rectifier/charger.
- Display a warning message.
- Sound an audible alarm.
- Retransfer the load back to normal mode.

The battery test feature shall have the following user selectable options:

DC bus-voltage threshold (pass/fail value) interval between tests (2 to 9 weeks) date and time of initial test enable/disable test.

**Static transfer switch** -- The static transfer switch bypass circuit shall be an integral part of the UPS. The static switch shall be a naturally commutated high-speed static (SCR-type) device rated to conduct full load current continuously. The switch shall have an overload rating of 125% rated load continuously, 200% rated load for thirty seconds, and 2000% rated load for two cycles. The static transfer switch control logic shall contain an automatic transfer control circuit that senses the status of the inverter logic signals, and operating and alarm conditions. This control circuit shall provide an uninterrupted transfer of the load to an alternate bypass source, without exceeding the transient limits, when an overload or malfunction occurs within the UPS System or for bypassing the UPS System for maintenance.

The transfer control logic shall automatically turn on the static transfer switch, transferring the critical AC load to the bypass source, after the transfer logic senses any of the following conditions:

- Inverter overload capacity exceeded.
- Critical AC load overvoltage or undervoltage.
- Battery protection period expired.
- UPS System fault condition.

The transfer control logic shall inhibit an automatic transfer of the critical load to the bypass source if any of the following conditions are present:

- Inverter/bypass-voltage difference exceeding preset limits.
- Bypass frequency out of limits.
- Bypass out-of-synchronization range with inverter output.

Retransfer of the critical AC load from the bypass source to the inverter output shall be automatically initiated unless inhibited by manual control. The transfer control logic shall inhibit an automatic retransfer of the critical load to the inverter if one of the following conditions exists:

- Bypass out of synchronization range with inverter output.
- Inverter/bypass-voltage difference exceeding preset limits.



Overload condition exists in excess of inverter full load rating.  
UPS fault condition present.

**Maintenance bypass switch** -- A manually operated maintenance bypass switch shall be incorporated into the uninterruptible power supply system cabinet to directly connect the critical load to the input AC power source, bypassing the rectifier/charger, inverter, and static transfer switch.

All energized terminals shall be shielded to ensure that maintenance personnel do not inadvertently come in contact with energized parts or terminals. A means to de-energize the static switch shall be provided when the UPS is in the maintenance bypass mode of operation. With the critical load powered from the maintenance bypass circuit, it shall be possible to check out the operation of the rectifier/charger, inverter, battery, and static transfer switch.

**Battery power pack** -- The battery power pack shall include sealed, lead-acid valve regulated battery cells housed in a cabinet that matches the UPS System cabinet styling to form an integral system line-up. Battery cells shall be mounted on slide-out trays for ease of maintenance. A disconnect means shall be included for isolation of the battery pack from the UPS System module.

**External maintenance bypass cabinet** -- A matching external maintenance bypass cabinet shall be provided to enable the UPS module to be completely isolated from the electrical system while the critical load is powered through the external maintenance bypass line. The external maintenance bypass cabinet shall be freestanding type cabinet with casters and leveling feet. The external maintenance bypass electrical system shall consist of UPS input circuit breaker, UPS output circuit breaker, and make-before-break single rotary switch with auxiliary contacts for transfer to and from the external maintenance bypass line. All circuit breakers and rotary transfer switch shall be sized to carry continuous rated UPS current at the rated load-voltage. The input and output breakers shall be back panel mounted and rotary transfer switch shall be door mounted and shall have a legend plate marked OFF-BYPASS-UPS.

**Remote contact board** -- Isolated Form C contacts shall be provided to indicate a change of status of each of the following conditions:

- UPS ready.
- UPS System on battery alarm.
- Low battery reserve alarm.
- Load on bypass alarm.
- Summary alarm.
- New alarm - a separate alarm for a second summary alarm.

## EXECUTION

**Installation** -- Equipment shall be installed as indicated on the plans and in accordance with manufacturer's instructions. Conduits in the UPS cabinet shall be located so they are out of the way of necessary access points of the UPS. A qualified representative of the UPS manufacturer shall be present to oversee/assist in the installation of the system to ensure that the proper procedure is followed.

Equipment shall be anchored firmly in place to comply with the area seismic requirements.

**Acceptance testing** -- After the system has been installed and load is connected, a qualified factory technician shall check the installation and perform initial on-site tests for compliance with the conditions specified in these special provisions. All necessary materials, test equipment and instruments, and labor required for tests shall be furnished. The contractor shall notify the Engineer not less than 3 working days in advance of testing. Testing shall be performed in the presence of the Engineer. During all UPS tests, all transient requirements shall be demonstrated by means of recording instruments.

The UPS shall be tested at 100 percent of UPS capacity utilizing a linear load bank with the utility input power being disconnected at the start of the test and no other input power to the UPS. The UPS shall automatically switch to battery back-up without affecting loads and be able to maintain proper output-voltage and frequency during the next 5 minutes. During the test, the following UPS conditions shall be indicated at the UPS:

- Load on UPS.
- UPS alarm conditions if any.

After no more than 5 hours period of battery recharging, another test similar to the test above shall be executed for a

duration of 7 minutes without any outside power connected too the UPS system. During the recharging period, the UPS output shall be monitored for output on line-voltage and frequency regulation.

At the end of the 7th minute of the test or any time there after as determined by the UPS manufacturers, the following UPS condition shall be indicated at the UPS:

- Load on UPS.
- UPS alarm conditions if any.
- Low battery reserve.
- Form C contact closure at the UPS.

Each test shall be a continuous trouble free operation. In the event that any component fails, the test must be performed again.

After the above two tests with the load bank and batteries fully recharged, the UPS system shall be connected for normal operation with their HID lighting load connected as shown on the plans. Again the UPS system shall be tested as follows:

Simulate a utility power failure with the HID lighting connected to the UPS. The UPS shall continue to supply the HID lighting with rated-voltage and frequency continuously without extinguishing the lamps. Record UPS output-voltage, frequency, load current, and battery-voltage every minute during the test.

At the end of the 5th minute during the test, the power shall be transferred back to normal power source. During and after this transfer, the HID lighting shall not extinguish and shall continue to glow at their rated light output.

Another test similar to the above test shall be performed with generator system acting as a standby source. This test shall be performed as follows:

All 400-watt and 70-watt HID lighting fixtures must be connected as shown on the plans and must be glowing with their rated light output.

Simulate a utility power failure. During this simulated power failure, all 400-watt HID lighting fixtures shall extinguish and all 70-watt HID lighting fixtures except 70-watt HID lighting fixtures which shall continue to glow with their rated light output through the UPS system.

The generator must start and come on line to supply the HID lighting load as shown on the plans. When generator come on line, the UPS system shall transfer 70-watt HID lighting load to the generator power without extinguishing the lighting fixtures.

In addition, 400-watt HID lighting fixtures must restrike and begin to glow with their rated light output within a time period as specified by the manufacturer.

This test shall be run for a period of 10 minutes. During the test the following must be recorded:

- Generator output-voltage.
- Generator current.
- Generator frequency.
- UPS output-voltage.
- UPS output current.
- UPS output frequency.
- Battery-voltage.

At the end of the 10 minute during the test, the power shall be transferred to normal utility power source. During and after this transfer, the 70-watt HID lighting fixtures shall not extinguish and shall continue to glow at their rated light output.

This above test shall be repeated twice in a row. Each test shall be a continuous, trouble free operation. In the event that any component fails, the test must be performed again.

## **10-5.08 FIRE ALARM AND DETECTION SYSTEM**

### **GENERAL**

This work shall consist of furnishing and installing a complete and operational fire alarm and detection system in accordance with the details shown on the plans and these special provisions.

The system shall include all materials, whether mentioned or not, but that are necessary for the complete and operational fire alarm and detection system.

The fire alarm and detection system shall be a low-voltage, direct current, 8-zone minimum, zoned, closed circuit, electrically supervised, Class A, style D fire alarm and detection system capable of identifying location of hot-spots. Each linear heat detector shall output a separate contact alarm for each of the following conditions:

High temperature alarm.  
Excess temperature alarm.

Each alarm point shall be independently adjustable over the entire range of the linear heat detector sensor. Each linear heat detector shall output an analog signal (4-20 mA) which is proportional to the distance of the temperature alarm.

Each linear heat detector shall be monitored for open and short circuit alarm. All individual alarm conditions shall be annunciated at the control panel and the analog data shall be displayed on the panel. Each meter shall show length of each linear heat detector with reference mark.

All system alarm signals for general fire alarm, supervisory and system trouble conditions shall be sent to the SCADA system and to a UL listed Central Station.

The system shall consist of fire alarm control panel, heat detector, linear heat detectors, and all other necessary appurtenances.

The alarm system components shall be UL or FM listed and approved by the California State Fire Marshal.

## **SUBMITTALS**

**Product data** -- Manufacturer's descriptive information and installation instructions shall be submitted for approval.

Installation instructions shall include brand name and catalog reference of equipment supplied, diagrams and floor plans showing all devices and conduit and conductor sizes.

A complete set of engineered drawings shall be submitted for approval by the Engineer and Roseville Fire Department prior to system manufacture. These shall include as a minimum the following:

1. Mechanical drawings of the control panel, annunciator panel and programmer showing location and types of indicators, pushbuttons, power supplies, printed circuit boards, terminal strips and enclosure.
2. Interconnection drawings showing terminal strip in the panel, individual circuit connections and typical wiring for each type of circuit.
3. Logic drawings showing operation of all alarm and trouble inputs and operating sequences.
4. Internal electrical schematic drawings showing wiring between all devices in the control panel.
5. Detection layout showing location of continuous linear heat detectors, junction boxes, control panel and interconnecting wiring.
6. Full power calculations to prove adequacy of power supplies for all zones going in alarm and all equipment operating.
7. Battery calculations.

## **MATERIALS**

**Fire alarm control panel (FACP)** -- Fire alarm control panel shall be a completely self-contained control panel suitable for 120-volt, AC, input power with separate terminals for external wires. Mount FACP in Control Center as shown on the plans.

The control panel shall conform to the following requirements:

- Minimum eight zones.
- Accept linear heat detector cable input.
- Alarm output relay contacts for each zone.
- Digital dialer communicator.
- Data link communication to the remote annunciator.
- Audible trouble signal and pilot light with silencing switch.
- Indicating lights for normal power failure and battery power failure with audible alarm and silencing switch.
- Solid state, modular construction.
- 24-hour standby sealed batteries (batteries may be mounted in a separate cabinet).
- Battery charger with automatic transfer on loss of utility company power and retransfer upon restitution of utility power.
- Batteries shall be supervised for continuity and low voltage condition.

**Remote annunciator (RA)** -- Remote annunciator shall be self contained and suitable for 120VAC power input with a separate terminal for external wires.

The remote annunciator shall conform to the following requirements:

1. Data link communication from the fire alarm control panel.

2. Display alarm and trouble conditions from 8 zones of linear heat detection.
3. Display trouble conditions from fire alarm control panel.
4. Battery charger with automatic transfer on loss of utility company power and retransfer upon restitution of utility power.
5. 24 Hrs. standby sealed batteries (batteries may be mounted in a separate cabinet).
6. Batteries shall be supervised for continuity and low voltage condition.

**Heat detector (HD)** -- Heat detector shall be a fixed temperature and rate-of-rise temperature type heat detector with normally open heavy-duty contacts. The temperature sensor shall be rated at 90°C (194°F). The contact rating shall be 1.0-ampere at 28-volt DC.

**Smoke detector (SD)** -- Smoke detector shall be a self-diagnostic, photoelectric smoke detector with built-in drift compensation. Smoke detector shall be capable of monitoring its own sensitivity and operational status, providing a visual indication if sensitivity drifts out of range or fails internal diagnostics.

**Linear heat detector (LHD)** -- Linear heat detector shall consist of a round coaxial wire capable of sensing temperature changes along its entire length. The sensor shall be constructed of a center conductor and outer stainless steel sheath. The center conductor shall be electrically insulated from the outer sheath by a ceramic sensor material. The ceramic material shall have a negative coefficient of resistance that will decrease exponentially as the surrounding ambient temperature increases.

The linear heat detector shall have the capability to allow the control equipment to provide three (3) independent field adjustable set points. Two of these set points shall be fixed temperature (pre-alarm and alarm) and the third shall be rate-of-rise. The control equipment shall supervise each circuit for open and short circuit conditions.

The linear heat detector shall be capable of withstanding ambient temperature extremes from -51°C to +1,093°C. The linear heat detector shall be capable of exposure to multiple overheat conditions within this temperature range without need for replacement or repair. Non-restorable fusible linear wires will not acceptable.

The linear heat detector shall be manufactured in fifteen (15) meter sections joined together using a single male and female, threaded, military grade hermetically sealed connector at each end. These sections shall be capable of forming individual thermistor detector assemblies up to three hundred (300) meter long.

Each linear heat detector assembly shall be provided in the proper length for each respective detection zone. The linear heat detector sections shall be preassembled at the factory to form the lengths required by the detection layout. All mating connectors shall be torqued per manufacturer specification and have a tamper indicator placed over each assembled connector.

Every linear heat detector assembly shall be labeled with a distinguishable part number indicating the length of the assembly and shall correspond to the part number on the installation drawing.

All final linear heat detector assemblies shall be factory tested prior to shipment.

**Linear heat detector terminator** -- The LHD terminator shall connect the LHD to the terminal block. The LHD terminator shall include a socket/plug mating coupler to connect to the hermetically sealed LHD connector. The socket/plug shall be assembled to a junction box and connected to an internal terminal board. The LHD terminator shall be a factory assembled product and shall be mounted in a NEMA 4X junction box suitable for surface mounting.

**Support clamps and brackets** -- The support clamps shall be spring hold type, stainless steel clamps. The clamp shall hold the LHD sensor approximately 1 inch from the bracket. The bracket shall be steel bracket suitable for mounting to the tunnel soffit. The support bracket and clamps shall withstand without failure the use of tunnel washing equipment.

**Spare parts** -- The contractor shall furnish the standard recommended spare parts as determined by the equipment manufacturers. The contractor's submittals shall show the recommended spare parts list prepared by the equipment manufacturers. The spare parts shall include such things as fuses, lamps, etc. The following spare parts, as a minimum, shall be furnished:

Quantity	Description
4	15 m length LHD sensor
1	Complete PC board rack with PC boards
24	Replacement indicating lights

## **EXECUTION**

**General** -- The fire alarm system shall be installed in accordance with the manufacturer's recommendations. No modification of the recommended alarm system type, components type, or replacement shall be made without prior written approval from the Engineer. Contractor shall be responsible for obtaining a Fire Alarm Permit from the Roseville Fire Department ((916) 774-5800) prior to installation.

**Conduit and conductors** -- Fire alarm and detection system wiring shall be installed in conduits conforming to the requirements of "Basic Materials and Methods" elsewhere in these special provisions.

Conductors and/or cables for the fire alarm system shall conform to the requirements of "Conductors and Cables" elsewhere in these special provisions.

**Testing** -- The operational test for the fire alarm system shall be performed by the Contractor in the presence of the Engineer. The operational tests shall demonstrate that all functions of the system operate in the manner described in the manufacturer's literature and that the system is stable under normal vibration and shocks to components. The Contractor shall notify the Engineer in writing not less than 10 days in advance of performing the operational test. This test shall be completed prior to the Contractor scheduling the acceptance test by the Roseville Fire Department. As part of the acceptance test, AC power to the fire alarm control panel shall be turned off, after 24 hours, the strobe light (H3) shall be turned on, the fire alarm control panel shall be able to power the strobe light for 4 hours on battery power.

**Training** -- The Contractor shall provide one hour of on-site training on the use, operation and, maintenance of the system for not more than 8 designated State employees. The Contractor shall notify the Engineer in writing not less than 10 days in advance of proposed training class.

## **10-5.09 CARBON MONOXIDE (CO) MONITORING SYSTEM**

### **GENERAL**

This work shall consist of furnishing and installing a complete operational carbon monoxide monitoring system in accordance with the details shown on the plans and these special provisions.

The system shall include all materials, whether mentioned or not, that are necessary for a complete and operational carbon monoxide monitoring system.

The carbon monoxide monitoring system shall be a minimum 12-point system and shall consist of carbon monoxide sensors, carbon monoxide controller and calibration kit. Carbon monoxide controller and related accessories shall be mounted in Control Center as shown on the plans. Products shall include such accessories and appurtenances, not mentioned, that are required for the proper installation and the operation of the carbon monoxide monitoring system.

### **SUBMITTALS**

Manufacturer's descriptive information installation and operation, and maintenance instructions shall be submitted for approval.

Installation instructions shall include installation layout, manufacturer and model number of equipment, and locations of carbon monoxide sensors. Submittal shall be approved prior to commencing the carbon monoxide monitoring system installation.

### **MATERIALS**

**Carbon monoxide controller** -- Carbon monoxide controller shall be microprocessor based, solid-state, fully programmable, 12 channels continuous CO monitoring controller with the following characteristics:

1. Controller shall display and alarm for sensors remotely mounted up to 1212 m away.
2. Each channel shall have 2 alarm set points.
3. Controller shall monitor itself for open and short circuits.
4. Controller shall have analog meter display.
5. Controller shall have latching push-button for individual channel display on meter.
6. Suitable for 120-volt, AC input power.
7. Output: 4-20 mA signal for each channel.
8. Controller shall have output contact relays for high and low alarm for each channel.
9. Controller shall have power supply to the sensors.
10. Controller shall have output range: 0-500 ppm

Output relays for high and low alarms shall be 120-volt, AC relay with 1 NO and 1 NC contacts rated 3-ampere at 120-volt.

**Carbon monoxide sensor** -- Carbon monoxide sensor shall be remote, diffusion type sensing head with three electrode electrochemical sensor and shall operate within temperature range of 0°C to 50°C and humidity of 10 to 90 percent. The sensor head shall have calibration mode switch to indicate calibration and self test functions.

Carbon monoxide sensor shall have the following features:

1. Input power: 8-30-volt DC, 30 mA.
2. Output: 4-20 mA analog output.
3. Response time: less than 30 seconds to 90% of final value.
4. Monitoring range: 0-500 ppm.
5. Principle operation: 3 electrode electrochemical oxidation.
6. Built in temperature compensation.
7. Built in EPROM to store all sensor specific information including the type of sensor, production date, zero value sensitivity, and the last calibration date.
8. Capability to be calibrated at central location.
9. LCD display.

Carbon monoxide sensor shall be industrial grade, housed in cast aluminum NEMA Type 4X enclosure, capable of withstanding temperature of 150°C without deformation and shall be rated for tunnel use. Sensor shall have a minimum life expectancy of 24 months. Replace sensors at no charge to the State should sensors fail within 24 months of operation.

**Calibration kit** -- Calibration kit shall consist of two cylinders of compressed (50 ppm and 200 ppm) calibration gas, cylinder regulator (total of two), and calibration adapter.

## **EXECUTION**

The carbon monoxide monitoring system shall be installed in accordance with the manufacturer's recommendations and as shown on the plans. No modification of the recommended carbon monoxide system component type or replacement shall be made without prior written approval from the Engineer.

**Conduit and conductors** -- All carbon monoxide monitoring system wiring shall be installed in conduit system conforming to the requirements under "Basic Materials and Methods" of these special provisions.

All conductors and/or cables for the carbon monoxide monitoring system wiring shall conform to the requirements of the "Conductors and cables " of these special provisions.

**Training** -- Before acceptance of the contract, the Contractor shall provide 5 bound, identified copies of the carbon monoxide monitoring system operation and maintenance instructions and provide an approximate one hour, on site training session on system use, operation and maintenance for not more than 8 designated State employees. The Contractor shall notify the Engineer in writing not less than 10 days in advance of proposed training class.

**Testing** -- The operational test for the carbon monoxide monitoring system shall be performed by the Contractor in the Engineer's presence. The operational tests shall demonstrate that all functions of the system operate in the manner described in the manufacturer's literature and demonstrate system stability under normal vibration and shocks to components. The Contractor shall notify the Engineer in writing not less than 10 days in advance of performing the operational tests.

## **10-5.10 INTRUSION ALARM SYSTEM**

### **GENERAL**

This work shall consist of furnishing and installing a complete and operational intrusion alarm system in accordance with the details shown on the plans and these special provisions.

The system shall include all materials, whether mentioned or not, that are necessary for a complete and operational intrusion alarm system.

The intrusion alarm system shall be a low-voltage, direct current, zoned alarm system, and shall consist of a control panel, magnetic contact switches, combination detectors, and manual keypad station. Each zone shall be "supervised, class B circuit." The end of line resistor shall be installed in the control panel.

The alarm system shall self-test and report status of individual zones.

The alarm system components shall be UL or FM listed. The system proposed shall be approved by the Federal Contract No. 03-375604

Communication Commission (FCC).

Zone 1: Operations building electrical room.

Zone 2: Operations building generator room.

Zone 3: Pumping plant.

## **SUBMITTALS**

Manufacturer's descriptive information and installation instructions shall be submitted for approval.

Installation instructions shall include manufacturer and catalog reference, and model number of equipment to be furnished, conduit and conductor sizes, wiring diagram, and floor plan showing locations of multiple switch contact monitor and devices.

## **QUALITY ASSURANCE**

The installer of the security alarm system shall be licensed by the State Department of Consumer Affairs, Bureau of Collection and Investigative Services. License numbers and expiration dates shall be included on all correspondence.

## **MATERIALS**

**Intrusion alarm control panel (IACP)** -- The control panel shall be an open type, completely self-contained control panel suitable for 120-volt, AC, input power with separate terminals for all external wires.

The control panel shall meet the following requirements:

1. Compatible with Radionics 6000 or 6500 receiver or equivalent.
2. Minimum 4 (four) zones.
3. Digital dialer communicator.
4. 12-volt auxiliary power supply.
5. Silent alarm signaling.
6. System connected to RJ31X or RJ38X telephone jack or equivalent.
7. Line test every twenty-four (24) hours.
8. 120-volt, AC, input.
9. Front accessible control and indication digital keypad.
10. Alarm output relay contact for each zone.

**Magnetic door switch (DS)** -- Magnetic door switch for swing door shall be a 2-section, high security, magnetically balanced, long life reed switch which cannot be defeated by an externally applied magnet, and shall be compatible with the material of the door on which it is installed. The switch shall be epoxied in the switch housing. Magnetic contact switches shall be the type capable of being concealed on the top of the door frame.

Switch and magnet shall be housed in a non-magnetic case.

**Digital keypad** -- The remote digital keypad shall be flush mounted outside on a door of the Operations Building as shown on the plans. The digital keypad shall have two separate SPDT outputs contact with selectable timings (10, 30, 35 seconds); multiple programmable codes, and 3 LED indicating lights for loop status, system status and shunt status. The digital keypad shall operate on DC power and contacts shall be rated one ampere at minimum 12-volt, DC. The digital keypad shall be wired to the control panel to turn on or turn off the entire system from each location. Digital keypad shall have 12-key with alarmed and ready lights and audible warning signal.

**Combination detector (CD)** -- Combination detectors shall be low-voltage, wall-mounted, wide angle microwave or passive infrared detectors with a detection pattern appropriate to cover areas indicated on the plans. Model must be specified on proposed installation layout. The detector shall have an LED indicating light.

**Heat detector** -- The heat detector shall be fixed and rate-of-rise heat detector with normally open contact. The temperature sensor shall be rated at 94°C (200°F). The contact rating shall be 1.0 amp at 28-volt DC.

## **EXECUTION**

The intrusion alarm system shall be installed in accordance with the manufacturer's recommendations. The intrusion alarm control panel shall be installed in the Control Center as shown on the plans.

Each swinging and sliding door which is to be enunciated at the control panel shall be fitted with a magnetic contact switch. The switch section without wires shall be recessed flush into the top edge of the door at the approximate center on

the door, and the switch section with wires shall be recessed flush in the top section of the door frame. The 2 sections of the switch shall be mounted directly opposite each other to provide maximum sensitivity. The wiring from each magnetic switch shall be run to the control panel in the zone dedicated for the intrusion alarm circuit.

Combination detector shall be mounted at not less than 2.3 m above finished floor at locations shown on the plans.

**Conduit and conductors** -- All intrusion alarm system wiring shall be installed in conduit system conforming to the requirements under "Basic Materials and Methods" elsewhere in these special provisions.

All conductors for intrusion alarm system wiring shall be as recommended by the intrusion alarm system manufacturer.

**Related work** – Attention is directed to the requirements specified under “Hinged Doors And Hardware” Section 12-01 of these Special Provisions regarding door hardware equipment to be connected to the electrical system.

**Testing** -- The operational test for the intrusion alarm system shall be performed by the Contractor in the Engineer's presence. The operational tests shall demonstrate that all functions of the system operate in the manner described in the manufacturer's literature and demonstrate system stability under normal vibration and shocks to components. The Contractor shall notify the Engineer in writing not less than 10 days in advance of performing the operational tests.

**Training** -- The Contractor shall provide one hour of on-site training on the use, operation, and maintenance of the system for not more than 8 designated State employees. The Contractor shall notify the Engineer in writing not less than 10 days in advance of proposed training class.

#### **10-5.11 PUMP CONTROL AND MONITORING SYSTEM**

##### **GENERAL**

Automatic operation of the drainage pumps shall be controlled by a Liquid Level Controller (LLC). This controller shall sense the water level via an analog signal from the pressure transducer.

The pumps shall be configured for a simple pump down, lead/lag application. When the water level rises to the “Start lead pump” elevation the lead pump will start and continue to run until the “Stop Pumps” elevation has been reached. Either pump no. 1 or pump no. 2 shall start when the water level rises to the “Start lead pump” elevation and continue to run until the water level falls to the “Stop pumps” elevation as shown on the plans. The remaining pump shall start when the water level rises to the “Start lag pump” elevation and continue to run until the water level falls to the “Stop pumps” elevation as shown on the plans. Pump no. 1 and pump no. 2 shall alternate with each lead pump call. Once a pump is started, it shall continue to run until the water level falls to the “Stop pumps” elevation as shown on the plans. Should the LLC call for both pumps to operate at the same time for any reason (such as when power is restored after an interruption and the water level is above the “Start lag pump” elevation), there shall be a time delay of ten (10) seconds between the starting of each pump. There shall also be a ten (10) second backspin time delay to prevent immediate restart of a pump after a pump shut off as part of the LLC controls. When the water level drops below “low level/shutoff” elevation the LLC shall shutoff the pumps and prevent them from starting until water level rises above the “low level/shutoff” elevation.

A seal failure indication on a seal failure relay shall be treated as an alarm indication only and in no way affect the control operation of a pump.

The phase failure relay shall provide sensing for voltage unbalance or failure. Whenever an abnormal condition occurs for more than five (5) seconds, the LLC shall deactivate all outputs until the condition returns to normal.

##### **SUBMITTAL**

Manufacturer's descriptive information and installation instructions shall be submitted for approval.

Installation instructions shall include manufacturer and catalog reference, and model number of equipment to be furnished, and wiring diagrams.

##### **MATERIALS**

**Liquid Level Controller** \_\_. The LLC shall be an industrial grade electronic duplex pump controller. The LLC shall be programmable through dip switches, pushbuttons, etc. There shall be no software configuration necessary. The LLC shall be provided with the following functions:

1. 3-digit LED display.
2. Alarm indication.
3. Setpoints and functions programmable from the front panel.
4. 4-20 mA output signal.



5. 4-20 mA input signal.
6. Input power: 120-volt, AC.

Water level shall be displayed locally as part of the LLC. The LLC shall also provide a 4-20 mA output signal for water level to the SCADA PLC.

**Level Monitoring System** \_\_. The level monitoring system shall consist of a pressure transducer and potentiometer. The system shall operate based on the output of the pressure transducer. The pressure transducer, which is submerged in the water, shall convert the pressure exerted on the transducer to an equivalent 4-20 mA signal. The transducer shall provide this 4-20 mA output signal to the LLC to determine the water level. There shall also be a test pushbutton and potentiometer to enable testing of the system by bypassing the pressure transducer input and allowing manual adjustment of the input signal. The system shall operate over a range of 0 to 10 meters of water with an accuracy of  $\pm 1$  cm for an ambient condition ranging from 0 to 93°C.

Pressure transducer shall be industrial grade, explosion proof type, stainless steel body, listed and labeled "Suitable For Class 1 Division 2 Locations".

## **10-5.12 SCADA SYSTEM**

### **GENERAL**

The SCADA system shall include the SCADA PLC, the local computer, the remote computer, the SCADA development software package and a runtime version, and all necessary communication equipment and devices.

The SCADA system shall be mounted within a NEMA 12 enclosure as shown on the plans.

### **SUBMITTALS**

Manufacturer's descriptive information and installation instructions shall be submitted for approval.

Installation instructions shall include brand name and catalog reference of equipment supplied, connection diagrams and procedures to be followed.

### **MATERIALS**

**Programmable Logic Controller (PLC)** -- The programmable logic controller shall include a power supply and a central processing unit (CPU) that operates at 120-volt, 60 Hz, AC line voltage.

The controller shall be capable of operating in the following environmental conditions:

1. Operating temperature: Between 0 and 60°C.
2. Humidity: 15 to 95% non-condensing.
3. Vibration: 57 to 150 Hz, constant acceleration 2g.
4. Shock: 15g, semisinusoidal 11ms.
5. Noise immunity: 1,500-volt, NEMA showering arc.

The PLC shall be programmable in ladder logic consisting of relay symbols and function blocks. The program shall be stored in a non-volatile memory without the need for battery back-up. The PLC shall be equipped with a computer link module that will allow the PLC to communicate with the local computer for programming and monitoring. The PLC shall also be capable of initiating communication with a telephone pager upon sensing any alarm conditions.

In addition to the requirements listed under "Description of Operation" in Section 12.15 of these Special Provisions, the PLC ladder logic program shall include the following provisions:

1. All tunnel ventilation fan control logic.
2. Accept data inputs from all the other control systems to be linked to the various SCADA windows: Pumping Plant, Ventilation Fans, Fire Alarm System, Carbon Monoxide Monitoring System, Lighting Control System, Intrusion Alarm System, Power/Generator Status, EMS, etc.
3. Alarms shall include power failure, intrusion, high water level, low water level, pump failure and pump seal failure.
4. All other control logic as needed.

The Contractor shall furnish a copy of all programming software and a disk copy of the ladder logic program to the Engineer.

**Inputs and outputs (I/O)** -- The inputs and outputs (I/O) shall be the digital and analog type as shown on the plans.

Terminal strip for I/O shall have a marking strip under a clear plastic cover inscribed with the wire identification. Each I/O shall have LED indicator to show when each input or output is activated. Each I/O shall operate at the voltage level of the connected devices and shall be optically isolated from the PLC. Analog output shall have the current or voltage level output required by the connected equipment.

Provide at least 10 percent of the I/O count as spares.

**Local Computer** --.The local computer shall be an industrial grade computer with a 2.2 GHz Pentium 4 Processor, 512 MB of PC800 RDRAM memory, 120 GB Ultra ATA/100 (<9.0ms) hard drive, 24x10x40 CD-RW drive with (50) 24x CD-R discs, 89mm floppy drive, mouse, keyboard, 2 speakers, sound card, and 64 MB AGP video card, 56K telephone dial up modem, Microsoft NT4.0 operating system, two USB ports, and two serial ports. The monitor shall be a 1200 HS 482mm (454mm v.i.s., 0.26 dp) monitor.

The local computer shall act as the master computer for SCADA development software, data logging, and local monitoring/control.

**Remote Computer** --.The remote computer shall be a 2.2 GHz Pentium 4 Processor with 256 MB of PC800 RDRAM memory, 20 GB Ultra ATA/100 (<9.0ms) hard drive, 48X CD-ROM drive, 89mm floppy drive, mouse, keyboard, 2 speakers, sound card, and 64 MB AGP video card, 56K telephone dial up modem, Microsoft NT4.0 operating system, two USB ports, and two serial ports. The monitor shall be a 1200 HS 482mm (454mm v.i.s., 0.26 dp) monitor.

The remote computer shall be for SCADA runtime software version only at the Traffic Monitoring Center and will be used for status and alarm indications.

**Software** --.SCADA software shall be a scaleable, object-oriented architecture process control software that runs on the specified computer. SCADA software shall consist of graphics, data logging, trending, alarm, DDE, security and telemetry functions. SCADA software shall be Wonderware, InTouch, National Instruments Lookout, or equal.

SCADA software shall be configured to suit the installed system. The Contractor shall supply one copy of the development package. The SCADA computers shall be set up with the following SCADA screens, as a minimum:

1. (1) Main page.
2. (4) Pumping plant.
3. (1) Operations building.
4. (3) Tunnel.
5. (1) Intrusion alarm.

**Main page:** The SCADA computers shall be set up with one overall graphic screen as the main index or menu page for navigating throughout the series of screens. The main menu page shall show the CALTRANS District 3 map with all major freeways and highways and the operations building and pumping plant shown geographically correct. The Engineer will furnish the Contractor with a district map upon request.

**Pumping plant:** The pumping plant representation shall serve as an icon or active button. The button shall launch to a separate screen on the computer showing the pumping plant. The display screen for the pumping plant screen shall show a picture of the pumping plant in elevation view. Elevation shall be relative to sea level. The pumping plant shall show each pump, color coded or animated to show running or stopped. Selecting a pump graphic shall bring up a START button if the pump is stopped or a STOP button if the pump is running. A changing contrasting color of water column shall show the water level in the pumping plant. A corresponding digital readout for water level shall be shown next to water column. An additional digital readout elsewhere on the screen shall show the total number of hours each pump has run since installation. The Engineer will furnish the Contractor with a pumping plant view upon request.

**Operations building:** The operations building representation shall serve as an icon or active button. The button shall launch to a separate screen on the computer showing the operations building in plan view. The operations building shall show the generator, UPS, and switchboard with appropriate graphics. Each graphic shall be color coded to show operating status.

**Tunnel:** The tunnel representation shall serve as an icon or active button. The tunnel shall have three screens. The first screen shall show the tunnel in elevation view with each ventilation fan represented on the screen with appropriate graphic, color coded or animated to show running or stopped. Below each fan's graphic shall be two digital readout windows. One window shall indicate whether the fan is running Forward or Reverse. The other window shall indicate whether the fan is running on High Speed or Low Speed. The second screen shall show the tunnel in elevation view with each carbon monoxide sensor represented on the screen with an appropriate graphic. Below each carbon monoxide sensor graphic shall be a digital readout showing the current carbon monoxide level in PPM. The SCADA system software shall store 30 days worth of carbon monoxide readings on the hard drive of the Local Computer. The third screen shall be the tunnel lighting screen. It shall have a digital readout to indicate the current lighting level and status of the lighting controller.

Intrusion alarm: The intrusion alarm screen shall show the outline of the operations building and pumping plant. Each zone shall be color coded to show alarm condition. When an intrusion alarm occurs, the SCADA computer screen shall automatically switch to the intrusion alarm screen.

Each screen other than the main menu shall have a button to return to the main menu. Each alarm shall be a line in red with time and date stamp and shall be shown on the lower end of the page. Multiple lines shall scroll. Acknowledgment of the alarm shall cause the alarm to change from red to black. Red color in the screen shall be used only for alarms.

Whenever an alarm occurs, this information shall be passed on to an alarm reporting application by DDE and the alarm reporting application shall call a pager and transmit the ID of pump plant in question.

Three level of passwords shall be set up for the SCADA software. Level one shall be the highest level allowing user to change everything. Level two shall allow user to change setpoints and to acknowledge alarms. Level three shall allow user to acknowledge alarms only.

The SCADA software shall be set up to poll the local computer on one modem line and reserve the second modem line for the remote computer to call in during an alarm condition. When an alarm occurs, the SCADA software shall automatically switch to the alarm screen.

Data logging shall be programmed for the following:

Alarms – Each occurrence  
CO Level – Every five minute

Data shall be continuously logged and saved to the hard drive.

**Alarms ---.**Alarm handling software shall be Fluid Solution, SCADAAlarm or Spector, Win-911 Windows NT4.0 version or equal, that can integrate with the SCADA software furnished. Whenever an alarm occurs as defined elsewhere in these special provisions, and if said alarm is not acknowledge after 60 seconds, the alarm handling software shall automatically dial a pager and send the pump plant ID number (BR. NO.). The alarm software shall be set up to allow the authorized person to acknowledge or check status of the pump plant via a touch tone phone keys. There shall be a user ID and password verification when accessing the alarm with a touch tone phone. The Engineer will furnished pager numbers for the contractor to program the alarm notification locations.

All hardware and software components of the SCADA system shall be delivered to the Engineer.

**Power Supply ---.**DC power supply shall be rated for 120-volt, AC input and DC voltage and current outputs as required by the equipment installed. The power supply shall be panel or channel mounted, convection cooled, completely protected and short circuit proof with an adjustment range of  $\pm 5$  percent (minimum) and shall be operable at temperatures between 0° to 50°C.

**Radio Communications System ---.**Radio shall be rated for 12-volt, DC operation at 900 MHz. Radio shall meet requirements for FCC certification. Radio shall include remote “loop back” diagnostic option, power cable and standard mounting bracket. Provide a RS-232 interface cable as required for connection to PLC.

Antenna shall be directional “YAGI” type. Antenna shall be provided with manufacturer’s antenna mounting kit with a bracket for installation per details shown on the plans.

Provide all accessories including but not limited to coaxial cable grounding kit, “O” ring seals, weatherproofing kit, and bulkhead mounted coaxial cable transient surge suppressor to make a complete and operating radio system.

Provide 8.7 m high, galvanized, 11 gauge round steel pole and antenna pole base per contract drawings.

### **10-5.13 PUBLIC SAFETY RADIO SYSTEM**

#### **GENERAL**

Provide a complete public safety radio rebroadcast system.

Provide a complete public safety 800MHz radio amplification system inside the tunnel per City of Roseville Fire Department requirements. The radio system shall provide adequate radio coverage as follows:

1. A minimum signal strength of -95 dBm available in 90% of the tunnel when transmitted from the closest City of Roseville Radio Communications System site.
2. A minimum signal strength of -95 dBm received at the closest City of Roseville Radio Communications System site when transmitted from 90% of the tunnel.
3. The frequency range which must be supported shall be 821 – 824 MHz and 866 – 869 MHz.
4. A 100% reliability factor.

Coordinate with Fire Inspector Karen Foster / City of Roseville Fire Department (916) 774-5827 for the closest City of Roseville Radio Communications System site location.

Amplification system shall be a radiating cable system or an internal multiple antenna system with or without FCC type accepted bidirectional 800 MHz amplifiers as needed.

Provide a complete PCS cellular amplification system capable of operating in the 1900 MHz range.

Provide a complete cellular amplification system capable of operating in the 800 MHz range.

## **SUBMITTALS**

Manufacturer's descriptive information and installation instructions shall be submitted for approval.

Installation instructions shall include manufacturer and catalog reference, and model number of equipment to be furnished, wiring diagrams.

## **MATERIALS**

**Radiating cable** -- Cable shall have corrugated, welded copper outer conductor over a low-density foam covering the inner conductor. Radiation from cable shall be through holes milled in the peaks of the outer conductor. Cable shall be capable of handling multiple RF bands and meet Steiner Tunnel test (UL 910).

**Emergency response amplifier** -- Amplifier shall be a low power, broadband linear gain device capable of receiving, filtering, amplifying, and retransmitting radio signals in the 821 – 824 MHz and 866 – 869 MHz range. Amplifier shall be designed for tunnel use, NEMA 4 enclosure, 120-volt AC.

**PCS amplifier** -- Amplifier shall be a low power, broadband linear gain device capable of receiving, filtering, amplifying, and retransmitting cellular signals in the 1900 MHz range. Amplifier shall be designed for tunnel use, NEMA 4 enclosure, 120-volt AC.

**Cellular amplifier** -- Amplifier shall be a low power, broadband linear gain device capable of receiving, filtering, amplifying, and retransmitting cellular signals in the 800 MHz range. Amplifier shall be designed for tunnel use, NEMA 4 enclosure, 120-volt AC.

**Emergency response antenna** -- Antenna shall be directional off air pickup type capable of operating from 805 – 960 MHz.

**PCS antenna** -- Antenna shall be directional off air pickup type capable of operating from 1800 – 2000 MHz.

**Cellular antenna** -- Antenna shall be directional off air pickup type capable of operating from 800 – 900 MHz

## **EXECUTION**

**Acceptance test** -- The radio rebroadcast system shall be tested to ensure that two-way coverage in the tunnel is a minimum of 90%. The tunnel shall be divided into a grid of approximately 20 equal areas. A maximum of two (2) nonadjacent areas will be allowed to fail the test. In the event that three of the areas fail the test, in order to be more statistically accurate, the tunnel may be divided into 40 equal areas. A maximum of four (4) nonadjacent areas will be allowed to fail the test. After the 40-area test, if the system continues to fail, the Contractor shall alter the system to meet the 90% coverage requirement at no additional cost to the State.

The emergency response system test shall be conducted using a Motorola MTS 2000, or equivalent, portable radio, talking through the City of Roseville Radio Communications System as specified by the authority having jurisdiction. A spot located approximately in the center of a grid area will be selected for the test, then the radio will be keyed to verify two-way communications to and from the outside of the building through the City of Roseville Radio Communications System. Once the spot has been selected, prospecting for a better spot within the grid area will not be permitted.

The PCS and cellular system test shall be conducted by a representative of the manufacturer. The Contractor shall show that all major cellular phone system is capable of receiving and sending calls clearly within the entire area of the tunnel.

The gain values of all amplifiers shall be measured and the test measurement results shall be filed with the Engineer for future test comparison.

**Field testing** -- Police and Fire personnel, after providing reasonable notice to the State, shall have the right to enter onto the property to conduct field testing to be certain that the required level of radio coverage is present.

## **10-5.14 DESCRIPTION OF OPERATIONS**

**Extinguishable message sign** -- Extinguishable message sign shall be controlled by a HAND-AUTO switch. In HAND mode, the sign will turn on. In AUTO mode, the sign will turn on when a contact closure signal is received from the PLC. The PLC shall turn on the sign under the following alarm conditions:

1. Alarm signal from the Fire Alarm Control Panel.
2. Alarm signal from the Carbon Monoxide Controller.

**Trouble light** -- The trouble light shall be controlled by the PLC. The light shall be turned on under any alarm condition. The light shall be turned off only after all alarm conditions have been acknowledged through the Local Computer.

**H3 light** -- The H3 light shall be controlled by the PLC. The light shall be turned on when a fire alarm condition occurs within the tunnel.

**Intrusion alarm system** -- Intrusion alarm shall occur whenever the door switch (DS) is opened or combination detector (CD) is activated and the system not deactivated with the Digital Keypad within 30 seconds. The intrusion alarm shall be set when the user activates the system with the Digital Keypad and closes the pump plant door within 30 seconds. When an alarm occurs, the Intrusion Alarm Control Panel shall send a contact closure signal to the PLC. The alarm signal shall indicate which zone the intrusion alarm occurred.

**Carbon monoxide monitoring system** -- Carbon monoxide Low Alarm shall occur when the CO reading from any sensor is above 65ppm for 30 minutes. Carbon monoxide High Alarm shall occur when the CO reading from any sensor is above 120ppm for 15 minutes.

**Power fail** -- Power failure alarm shall occur when the utility power fails, as indicated by the phase failure relay.

**Pump seal** -- Pump seal failure shall occur when the seal failure relay senses moisture in the oil reservoir of the pump motor.

**Ventilation fan** -- The ventilation fans are controlled by both a time clock and the PLC. Under time clock control, the fans shall run forward at low speed between 6AM-10AM and 3PM-7PM. Should the carbon monoxide level within the tunnel rise to above 120ppm for more than 5 minutes, the PLC shall override the time clock and switch the fans to high speed. At any other time, the PLC shall turn the fans on forward at low speed should the CO level rise above 65ppm for more than 5 minutes. If the CO level increases to above 120ppm for more than 5 minutes, the PLC shall switch the fans to high speed.

## **10-5.15 PAYMENT**

The contract lump sum price paid for electrical work (operations building and tunnel) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing the service and distribution equipment, electrical equipment, lighting, standby generator, uninterruptible power supply system, fire alarm and detection system, carbon monoxide monitoring system, intrusion alarm system, pump control and monitoring system, SCADA system, and public safety radio system complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## **SECTION 10-6. MECHANICAL WORK (OPERATIONS BUILDING AND TUNNEL)**

Mechanical work (operations building and tunnel) shall consist of all work involved (including the furnishing of all materials, tools equipment and incidentals) in the construction of the plumbing system, the fire protection system and the ventilation system of the operations building and the tunnel complete in place in accordance with details shown on the plans, the provisions in the Standard Specifications and these special provisions.

### **10-6.01 PLUMBING SYSTEM**

#### **GENERAL**

The plumbing system shall consist of furnishing and installing all materials and performing all labor necessary for the complete installation of the plumbing systems in the operations building and the tunnel. The work shall include, but not be limited to:

Domestic cold water piping

Vent piping  
 Valves and related service items  
 Piping Supports  
 Disinfection, test and balance

## SUBMITTALS

Manufacturer data and shop drawings, test reports, operations and maintenance manuals, warranties, certifications, inspection reports and record drawings shall be submitted to the Engineer.

## MATERIALS

**Pipe and Fittings** –Pipe sizes and fitting types shall be as follows:

<b>Water Piping:</b>	Type L copper tubing hard temper, American Standards for Testing and Materials (ASTM) B88, with wrought copper or cast brass solder type fittings.
<b>Rainwater Drain:</b>	Service weight cast iron pipe and fittings, or Schedule 40 black steel pipe ASTM A120 or A53 black cast iron drainage fittings.
<b>Vent:</b>	Schedule 40 black steel with malleable iron fittings.

**Hangers and Supports** –Hangers and piping supports shall be as follows:

Overhead piping: Elcen Figure 90, Grinnell Figure 260, Super Strut C711, or equal, with felt isolator for copper tubing.

Piping supported along walls: Elcen Figure 43, Super Strut C-708, or equal.

Valves shall be full size of pipe, Crane Co., Stockham, Nibco/Scott, or equal, according to following schedules:

### THREADED TYPE

TYPE	SIZE	CRANE	STOCKHAM	NIBCO/SCOTT
GATE	50 mm & Less	1701	B-103	T-113

### SOLDER TYPE

TYPE	SIZE	CRANE	STOCKHAM	NIBCO/SCOTT
GATE	50 mm & Less	1701S	B-104	S-113

**Unions** – Unions shall be as follows:

TYPE OF PIPE	UNION
Steel Pipe Lines 50 mm & Smaller	1034 kilo Pascals (kPa) screwed malleable joint, brass to iron seat, Crane No. 1280 Black, or approved equal, for black pipe lines, galvanized for galvanized lines.
Type “L” Copper Tubing 50 mm and Smaller	Mueller Co., Brass, or approved equal, ground joint seat, sweat connections.

**Pipe Joints and Connections** -- Threaded Pipe: Use Armite Joint Seal Compound No. 250, Enterprise Commercial “Thred Seal”, Baker Oil Tool Teflon “Bakerseal”, or equal. For diesel fuel and oil piping use a compatible compound; gasoila, or equal.

**Flexible Piping Connections** -- Pipe joints and connections shall be as follows: Stainless Steel Type with Liner: Flexible hose, type 316 stainless steel braided cover with lay line and teflon liner, ductile iron or cadmium plated steel National Pipe Thread (NPT) fittings with corrosion resistant coating. Underwriters Laboratory (UL) approved for diesel fuel. Minimum Bend Radius: 40 mm diameter = 115 mm; 50 mm diameter = 135 mm.

Manufacturer: Resisto Flex Company – Flexible PTFE connector, B.F. Goodrich, Tite-Flex Series, Teleflex Series 60-

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10, or equal.

**Miscellaneous Equipment** -- Hose Bibbs: Acorn 8121, or equal, with vacuum breaker and loose key, rough brass finish.

Backflow Preventers: Beeco, ClaVal, Watts, or equal, reduced pressure type with bronze body, and corrosion resistant trim, gate valves and test cocks.

Area Drain: J.R. Smith #2230 or equal, medium duty, 300 mm diameter top, 105 mm deep slotted sediment bucket with lift bar, all cast iron construction.

**Flashings** -- Flashings shall be as follows: Stoneman, Semco Series 1100 or equal, conical 1.8 kilograms (four (4) pound) sheet lead flashing with 200 mm minimum skirt and counter flashing sleeve, with cast lead caulking integrally molded.

## **INSTALLATION**

Installation of the plumbing system and disposal of waste material shall be but not limited to the following:

**Surface Conditions** -- Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

**Plumbing System Layout** -- Lay out the plumbing system in careful coordination with the drawings, determining proper elevations for all components of the system and using only the minimum number of bends to produce a satisfactorily functioning system. Follow the general layout shown on the drawings in all cases except where other work may interfere.

**Installation of Piping** Install piping parallel to walls. Clear all obstructions, preserve headroom and keep openings and passage ways clear whether shown or not. Constantly check with other work to avoid interference.

Use reducing fittings where any change in pipe size occurs. Bushings shall not be used. Use eccentric reducing fittings wherever necessary to provide free drainage of lines.

Cap or plug ends of pipe immediately after installation to prevent entrance of foreign matter and leave in place until removal is necessary for completion of installation.

All water piping shall be run generally level, free of traps or unnecessary bends, and to suit the necessities of clearance for other work.

Run all horizontal rainwater drain piping on uniform grade of not less than 6.35 mm per 300 mm unless otherwise shown.

Run all drainage piping as straight as possible with easy bends with long turns; make all offsets at an angle of 45 degrees or less.

Vent piping: Grade so as to free itself quickly of any water or condensation.

**Sleeves and Openings** -- Install sleeves of sufficient size to allow for free motion of pipe.

Where pipes penetrate walls or slabs, install permanent sleeves of Schedule 40 galvanized steel pipe. Finish flush when in walls and extend minimum 50 mm above floor when passing through floor slabs.

Caulk annular space between pipe and sleeves through outside walls and make watertight as recommended by manufacturer. No visible leakage at sleeves will be permitted and shall be repaired.

Fit all pipes with or without insulation passing through floors, walls or ceilings, with chrome plated steel plates having screw or spring clamping device and concealed hinge.

Where pipes require special size of plates, provide type manufactured from stainless steel or suitable gauge.

**Pipe Joints and Connections** -- Cutting: Cut pipe and tubing with a power hacksaw, circular cutting machine using an abrasive wheel, or on a square end sawing vise by means of a hand hacksaw.

Threaded Pipe: Make up joints in threaded piping in accordance with the following service schedules:

Armite Joint Seal Compound No. 250, Enterprise Commercial Thred-Seal, or approved equal.

Place joint compound carefully and smoothly on male thread and not in fittings.

Make threaded joints tight with togs or wrenches. Caulking of any kind will not be permitted. Remake leaky joints with new materials.

Use of thread cement or caulking to make end joint tight is absolutely prohibited.

Use only American Standard Pipe Threads. Cut all thread accurately, with not more than two threads showing beyond fitting.

**Copper Pipe:** Make up all joints in copper pipe for all installations with silver brazing alloy, 587°C. melting point or greater, American Society of Testing and Materials (ASTM) B260. Piping above ground may be made up with 95-5 tinantimony, ASTM B32-76, solder, or use 50/50 tin lead solder with copperized flux.

Surfaces to be jointed shall be cleaned of oil, grease, rust, and oxides. Remove grease from fittings by applying carbon tetrachloride with a brush.

Clean socket of fitting and end of pipe thoroughly with crocus cloth to remove rust and oxides.

After cleaning and before assembly or heating, apply Handy or Aircosil Flux to each joint surface and spread evenly. Apply heat with an oxyacetylene torch.

Make joints in accordance with instructions in Bulletin 17, published by Handy and Harmon Company, or Air Reduction Catalog No. 925.

Exercise extreme care to prevent overheating of pipe and fittings.

Use friction wrenches exclusively when erecting plated, polished, or soft-metal piping.

**Rainwater Drain:** Cast iron: Make joints with neoprene gaskets conforming to Cast Iron Soil Institute Standard HSN 78 and American Society for Testing and Materials (ASTM) C425-77.

Care shall be taken in the joining of hubs and spigots to avoid binding of gaskets and insure proper seating and a sound joint.

Pipe run under slab or underground shall be properly supported and aligned by partial backfilling and cradling or by the use of adequate metal stakes or braces fastened to the pipe. Piping laid on grade shall be adequately staked to prevent misalignment of piping when the slab is poured.

**Hangers and Supports --** Support all piping so that it is firmly held in place by approved iron hangers and supports. All components shall support the weight of pipe and fluid, based on spacing of supports and safety factor. Do not exceed manufacturers load rating.

Do not install hanger material until approved.

Do not support piping by any wire, rope, wood, or other makeshift devices. Do not use any valve or piece of equipment to support the weight of any pipe.

Rigidly fasten hose faucets and similar items at ends of pipe branches to building construction near point of connection.

Insulate copper tubing from ferrous material and hangers with two thicknesses of 75 mm wide strip of 0.0254 mm polyvinyl tape wrapped around pipe.

Do not burn or weld any structural member unless approved by the Structural Engineer.

**Cathodic Protection --** Provide cathodic protection shown and at the following locations:

In metallic water service connections within 1525 mm of building wall. Install adjacent to shut-off valve and above ground. At points of connection where copper water lines connect to ferrous piping.

**Pipe Wrap:** Cover bare galvanized or black steel pipe buried in ground with corrosion protective polyvinyl chloride tape wrap.

**Backflow Prevention:** Protect fixtures and faucets with hose connections against possible back-siphonage. Arrange for testing of backflow devices as required by the agencies having jurisdiction. Submit test certifications.

**Concrete –** Concrete, where required, shall conform to the provisions in Section 90-10, “Minor Concrete”, of the Standard Specifications.

**Disinfection of Water System --** Prior to final inspection, clean and disinfect domestic cold water systems and fire protection systems connected to domestic water mains. Perform all work per American Water Works Association (AWWA) Standard Procedures for Disinfecting Water Mains and as required by local building and Health Department Codes.

With all fixtures connected and operable and ready for use and when, by test, system is proved to be free from leaks, thoroughly flush by fully opening every outlet and operating until clear water flows from all outlets.

Fill system completely full of water and inject disinfectant slowly and continuously at an even rate (not in slugs) until an orthotolidin test at each outlet shows a chlorine residual concentration of at least 50 parts per million (ppm).

Maintain condition for 24 hours with chlorine residual of 50 ppm retained in system for this 24-hour period. If, after 24 hours, orthotolidin tests indicate that chlorine residual concentration has decreased below 50 ppm, then disinfection procedure must be repeated until an approved result is obtained.

When the above procedure has been completed, flush out entire system with fresh water until an orthotolidin test at any outlet shows a residual of not more than 0.2 ppm.

Post warning signs at all outlets and in conspicuous areas while disinfecting the system.



**Testing of Piping** -- All piping shall be tested at completion of roughing in, or at other times as directed by the Engineer. Test in accordance with the following schedule to show no loss in pressure or visible leaks after a minimum duration of four (4) hours at the test pressures indicated.

Isolate from the system all equipment which may be damaged by test pressure.

#### TEST SCHEDULE

SYSTEM TESTED	TEST PRESSURE kPa	TEST WITH
All rainwater drain piping	Fill with water to top of highest point in system; allow to stand 2 hours or longer as directed by Inspector.	Water
All cold water	1034	Water
Diesel fuel vent	35	Water and soap suds

Where tests show materials or workmanship to be deficient, replace or repair as necessary, and repeat the test until the specified standards are achieved.

Install all drains required for testing, purging or flushing. Upon completion of work, plug and seal weld openings. Plugs on permanent drains as depicted on drawings shall not be seal welded.

**Disposal** -- Safely dispose of all flush, disinfection and testing water in conformance with applicable ordinances regulating the disposal of chemicals used in such operations.

## 10-6.02 FIRE PROTECTION SYSTEM

### GENERAL

The fire protection system shall consist of furnishing and installing all materials and perform all labor necessary to complete the fire protection system, inside the tunnel. Work shall include, but not be limited to:

- Fire Sprinkler Main Pipe
- Fire Hose Stations
- Seismic Supports of Piping
- Testing

Fire extinguishers will not be required to be installed in the completed tunnel, but will be needed during construction as required by Cal OSHA Construction Safety Orders.

**Related Work** --Provide on-site water and fire protection distribution system; Conformance with the 1999 Fire Code (RFC), NFPA 502 (1998 edition), and related fire protection design standards; tunnel drainage collection system.

**Quality Assurance** -- Provide all material and perform all work in accordance with all applicable codes, standards, manufacturers written instructions and per Standard Specifications requirements.

### SUBMITTALS

The Contractor shall prepare and furnish complete working drawings for the installation of the tunnel fire protection system and submit to the Engineer. At a minimum, the submittal shall include the following:

- The address/name of the project must be the most dominant address on the cover sheet and appear with the project name on each sheet.

- Each sheet must be wet signed and stamped by the individual assuming design responsibility for the sheet.

- Provide a site map for the project showing the project location.

- Provide a Roseville Fire Department signature block (signature line and date line) on the cover sheet for approval of the project. The title Fire Inspector shall be placed under the signature line.

- Identify all proposed phasing of the project on the site map. Where fire apparatus access roads and fire service water mains are proposed for construction as part of the phase they shall be clearly identified on the site plan.

Specific Requirements:

- Hydraulic Calculations: Submit hydraulic calculations accounting for pressure drop through backflow

prevention devices, strainers and hydrants and using the Hazen-Williams formula to calculate frictional losses in piping and fittings to:

Demonstrate that the hydraulically most remote area of the fire service water main for the project is adequate to provide the required flow of 15.775 liters per second (L/S) fire hose station system demand when the hydrants are not flowing.

Demonstrate that the hydraulically most remote area of the fire service water main for the project is adequate to provide the required fire flow to the on-site hydrants.

Demonstrate that the main is capable of providing the required flows while maintaining a 137.8 kilo pascals (kPa) minimum residual pressure in the system.

Restraint System: Provide seismic bracing as required by National Fire Protection Association (NFPA) 13. Submit hangers and supports; seismic structural calculations.

Pipe material and fittings above ground in tunnel and underground for connection to on-site fire service shown on civil plans.

Size, type, location, manufacturer and model number of all fire hose stations, valves.

Detail and dimensions to clearly indicate that the fire main will be arranged neatly in exposed area of the tunnel and not conflict with other structural, mechanical, or electrical work.

Product data and manufacturer literature. Submit model numbers of fire hose stations.

How the installed system will interface with the electrical and fire detection systems.

The Contractor shall also submit all Operation and Maintenance Manuals, all test and certification reports, and record drawings.

Related work specified elsewhere in these special provisions: Water Supply System, Fire Hydrants and Fire Protection Assembly, Alarms, controls, and fire detection systems.

## **MATERIALS**

All materials and equipment shall be new and of latest design of the manufacturer and shall be tested and approved by the Underwriters Laboratories (UL), Inc.

### **Pipe and Fittings:**

Pipe for installation above ground shall be UL and State Fire Marshall (SFM) approved ASTM A-53, A-135.

Mains: Schedule 40 black steel.

Fittings to be UL approved cast iron screwed or grooved with associated couplings. Mechanical tees, saddle fittings, beveled edge fittings and bushings shall not be used.

Pipe for connection 1525 mm outside the tunnel, underground, to connections to on-site fire mains shall conform to AWWA C900, Class 200 (Polyvinyl Chloride Pipe) or AWWA Standard C-151-6, Class 50 (Ductile Iron Pipe).

### **Hose Station (FHS)**

Provide and install three (3) angle hose valves inside the tunnel as indicated on the plans. Provide Potter-Roemer Model 4065 (or approved equal) angle valve, 65 mm size, cast brass with red handwheel, female N.P.T. threaded inlet by male threaded outlet, 136 kg rated.

Number and location in tunnel as shown on the plans.

Provide a threaded cap with retainer chain on each valve outlet.

Provide identification decal "FIRE DEPARTMENT VALVE" on tunnel wall at each valve.

Inspector's test connections shall be reliable No. 63, or equal.

**Flashings and Counterflashings:** Proposed methods of sealing penetrations through exterior of tunnel walls shall be submitted to the Engineer for approval.

## **INSTALLATION**

Installation of the fire protection system shall not be started until complete plans and specifications, including water supply information, have been approved by the Engineer and Roseville Fire Department.

**Installation of Piping Systems --** Support all piping firmly held in place by approved iron hangers, supports, anchors as required. Grade as required to drain at low points. Seismic bracing shall be complete pre-engineered system Pipe Shields Inc., Tension 360 or equal.

Pipe and hose stations shall be located away from pedestrians and traffic.

Provide signing as required by Section 6-6 of NFPA 502.

**Drains** -- Inspector's test drain shall be installed with auxiliary drains on all low points of the system. Drain valves shall be piped to a safe place of visible discharge either by open-end pipe or sight drain fitting. Flushing connections shall be provided at ends of all cross mains.

**Electrical Requirements** -- All control wiring, conduit, fuses, thermal overloads, disconnect switches, panels and connection of all motors, alarms, flow switches is provided elsewhere in these special provisions.

**Coordination** -- The sprinkler Contractor shall be responsible to coordinate the location of sprinkler piping with all other trades such as ventilating fans and electrical work, and it shall be the sprinkler Contractor who shall off-set and modify the sprinkler system as may be required to coordinate the sprinkler system with all other systems as shown and/or detailed.

**Tests and Approvals** --At various stages of work and upon completion, prior to acceptance of the installation, the Contractor shall subject the entire system to flushing and hydrostatic pressure tests required by NFPA. All tests shall be in the presence of the Engineer.

After flushing system, test fire sprinkler piping hydrostatically, for a period of 2 hours, at not less than 1380 kPa or 345 kPa in excess of the maximum static pressure when the maximum static pressure is in excess of 1034 kPa. Check system for leakage of joints. Measure hydrostatic pressure at the low points of the system.

If leakage is detected during testing, repair or replace piping system as required to eliminate leakage and retest to demonstrate compliance.

Furnish the Engineer with a certificate that entire system has been inspected, tested and approved.

### **10-6.03 VENTILATION AND EXHAUST SYSTEMS**

#### **GENERAL**

The ventilation and exhaust systems shall consist of furnishing and installing all materials and performing all labor necessary to complete the ventilating and exhaust air systems in the operations building and tunnel. Work shall include, but not be limited to:

- Ventilation Fans – Vane-Axial
- Exhaust Fans – Centrifugal
- Sound Traps
- Generator Muffler, Exhaust and Vent Pipes
- Exhaust Air Ducts
- Acoustical Insulation
- Air Distribution Devices
- Supports and Vibration Isolation
- Control Systems
- Testing and Balancing

The following shall be submitted to the Engineer:

Manufacturer data and shop drawings.

All design analysis and structural calculations as required.

All permits, test and balance reports, operations and maintenance manuals, warranties, certifications, inspection reports and record drawings.

#### **MATERIALS**

**Ventilation Fans (Vane-Axial)** -- Fans shall be axial-flow type for reversible operation. Fan-motor assembly shall be required to operate in the forward or reverse direction of airflow, with a capability of starting, stopping, or reversing the direction of the flow at any time.

Fan motors shall be direct-driven by internally mounted electric motors, with provisions for manual adjustment of the pitch of the blades, i.e., blade setting, or stagger angle. Fan-motor units and their supports shall be designed and constructed for the arrangement shown on the drawings.

Motors shall be the product of a single manufacturer, whose name shall appear on the motor performance curves and other data submitted. The motors shall conform to all applicable American National Standards Institute (ANSI), Institute of Electrical and Electronics Engineers (IEEE) and National Electrical Manufacturers Association (NEMA) standards.

Motors shall be of the totally enclosed, air-over, cast iron induction type, continuous duty, variable torque. Motors shall not be equipped with heaters or self-contained thermal protective devices.

Fan housing shall be hot rolled steel (ASTM A283) with a minimum 7 gage (Ga) thickness. End flanges shall be 635 mm thick. All flanges shall be continuously welded around the entire periphery of fan housing. End flanges shall be provided with bolt holes for bolting to inlet bell, cones, companion flanges, duct, etc. Housing shall be continuously welded and shall be expanded by mechanical means to ensure concentricity. Housing shall be shot-or sand-blasted to near white condition inside and out in order to ensure good paint adherence.

Not less than eight (8) die-formed stationary guide vanes of minimum 7 Ga. steel shall be welded inside the fan housing. The motor support plate shall be 20 mm plate steel, recessed and rabbetted to receive the c-face flange of the motor, and welded to the fan housing by means of a motor support ring and the guide vanes. Motor support ring shall be not less than 9.5 mm and shall be continuously welded to the motor support plate to ensure the rigidity of the entire structure. All welding shall be in accordance with American Society of Mechanical Engineers (ASME) Section IX Standards.

Impeller hub and blades shall be of cast aluminum construction. Hub to be cast of 356-T6 or equal aluminum alloy, heat treated. Fan hub shall have an integral steel insert, properly keyed for attachment to the shaft. The impeller hub and insert shall be positively locked to the drive shaft by means of a ball bearing locknut and washer.

Fan blades shall be airfoil shaped for maximum efficiency and shall vary in twist and width from hub to tip to obtain equal air distribution along the blade length. Blade tip clearance to fan housing shall not exceed 1.9 mm. Fan blades shall be cast around a forged steel stud to form an integral unit and shall be securely fastened to the hub. The fan impeller shall be whirl tested to 125% of design speed and shall be statically and dynamically balanced on the drive shaft to a maximum tolerance, guaranteed in writing, of 0.19 mm double amplitude at design operating speed.

Blade adjustment shall be accomplished by the use of individually, manually adjustable blades. Each blade must be index marked for various pitch settings and shall be capable of field adjustment without removal of the impeller from the drive shaft.

Vane-axial fans shall be in arrangement #4 with the motor located inside the housing downstream of the impeller, to avoid air disturbance at the inlet and to allow easy access to the fan impeller. Motors shall be NEMA Standard, cast iron, open bearing construction with inner bearing caps, equipped with ball bearings, Anti-friction Bearing Manufacturer's Association (AFBMA) rated with a minimum of 20,000 Hr. L-10 to allow operation in a 40°C ambient and at Class "B" temperature rise. Motors shall be totally enclosed air-over (TEAO) "C" face, flange mounted, squirrel cage induction, suitable for operation in horizontal position. Motor flange shall be recessed into motor support plate to preclude any shear effect or misalignment.

External grease leads for lubrication of motor bearings shall be provided by the fan manufacturer. Lead wires from the motor shall be continuously extended to an oversized conduit box mounted on the exterior of fan housing and wired in compliance with National Electrical Code (NEC) and NFPA 70 standards. Lead wires from the motor shall be protected from the airstream by being encased in an airtight metal conduit pipe. Flexible conduit is not acceptable. Lead wires shall be permanently numbered and non-wicking. Motor shall be capable of operating at the voltages specified on the fan schedules.

Fans shall be provided with supports for horizontal mounting as indicated on the drawings. Supplier to provide seismic and load calculations and mounting hardware kits. Indicate all items on Submittal shop drawings.

Sufficient lifting lugs shall be provided on each fan assembly to facilitate on-site installation and removal. Fan supports shall be cross-braced as required to prevent misalignment and add structural rigidity. Supports shall be constructed of the fan equivalent or heavier gauges of carbon steel. Horizontal ceiling supports shall consist of clips welded to the fan housing for field furnished support rods.

In addition, manufacturer shall provide inlet bell, inlet screen, outlet cone, outlet screen, disconnect switch, companion flanges.

The fan manufacturer shall furnish published performance curves with data based on tests conducted in an American Movement and Control Association (AMCA)-Registered laboratory in accordance with AMCA Standard 210-96.

Manufacturers not submitting performance data in full accordance with this paragraph will be required to perform a witnessed AMCA test for each fan/motor size specified. All costs for such testing and witness shall be borne by the fan manufacturer.

The fan manufacturer shall furnish published sound power level (PWL) data based on tests in an AMCA-Registered laboratory and conducted in accordance with AMCA Standard 300-85. Such data is to define Sound Power Levels (PWL), re: 10-12 watts for each of the eight (8) octave bands.

Manufacturers not submitting noise data in full accordance with this paragraph will be required to perform a witnessed AMCA test for each fan/motor size specified. All costs for such testing and witness shall be borne by the fan manufacturer.

The combination of the vane-axial fan and sound trap shall not produce a noise level greater than that specified on the drawings. Levels must be recorded with air flow in forward and reverse flow. Manufacturer to submit documentation of assembly for review prior to construction.

Performance: The manufacturer shall have regularly engaged in the manufacture of the specified type of vane-axial

fans, and shall furnish a list of at least five (5) locations within the USA where fans meeting performance and construction criteria of these specifications have been in satisfactory use for a minimum of five (5) years.

Manufacturer shall submit maintenance manuals which shall provide technical support for fan maintenance. Manuals shall provide a clear explanation of the theory, operation and maintenance of the equipment, accompanied by photos and schematic, wiring and mechanical assembly diagrams, as required. The manual shall be indexed and cross-referenced in an easily understood manner. The manual shall be loose leaf bound and shall include, but not necessarily be limited to, the following information:

- Troubleshooting and fault isolation procedures for on-site repair.

- Fan removal and replacement procedures.

- Disassembly and reassembly instructions.

- A list of the components which are replaceable at the three possible levels of maintenance: On-site, authority's shop, and the fan manufacturer facility.

- A preventive maintenance schedule and instructions detailing lubrication of moving parts.

- A list of special tools provided by the fan manufacturer.

- Template for blade angle setting.

- A list of tools and test equipment required to perform all maintenance tasks.

**Sound Traps --** Furnish tubular silencers of the types and sizes shown on plans and listed in the schedule. Silencers shall be the product of Industrial Acoustics Company, or other manufacturer compatible with the vane-axial fans specified.

Outer casings of the round silencers shall be made of not less than 10 gauge galvanized steel in accordance with American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) GUIDE recommended construction for high pressure duct work. Seams shall be lock formed and mastic filled.

Outer and interior partitions shall be made of not less than 16 gauge galvanized perforated steel.

Filler material shall be of inorganic mineral of glass fiber of a density sufficient to obtain the specified acoustic performance and be packed under not less than 5% compression to eliminate voids due to vibration and settling. Material shall be inert, vermin and moisture proof.

Combustion rating for the silencer acoustic fill shall be not less than NFPA Bulletin 90-A of flamespread classification 25 or less; smoke development rating 50 or less.

Airtight construction shall be provided by use of a duct sealing compound on the job site. Material and labor furnished by contractor. Silencers shall not fail structurally when subjected to a differential air pressure of 200 mm w.g. inside to outside of casing.

**Aerodynamic Performance:** Static pressure loss of silencers shall not exceed those listed in the silencer schedule as the airflow indicates. Airflow measurements shall be made in accordance with applicable portions of ASME, AMCA airflow test codes. Tests shall be reported on the identical units for which acoustic data is presented.

**Acoustic Performance:** The manufacturer shall supply with submittals certified test data on Dynamic Insertion Loss, Self-Noise Power Levels, and Aerodynamic Performance for Reverse and Forward Flow test conditions. Test data shall be for a standard product. All rating tests shall be conducted in the same facility, shall utilize the same silencer, and shall be open to inspection upon request from the Engineer.

See Ventilation Fans – Vane-Axial, and plans for acoustic performance requirements of complete assembly.

**Ventilation Fans (Centrifugal) --** Furnish in type, sizes and capacities Penn, Greenheck, Cook or equal fans as specified and. Fan construction, speed, noise level, will be taken into consideration in approval of fans.

**Fan Performance Data:** Certify as per AMCA Standard Test Code for centrifugal fans or shall bear AMCA certified ratings label, statically and dynamically balanced. Bearings shall be self-aligning grease lubricated, mounted in cast iron or malleable iron housing with readily accessible lubrication fittings, AFBMA 35,000 hour life design.

**Ventilation Exhaust:** Belt or direct driven, with backward curved centrifugal wheel, venturi inlet. Fan housing shall be heavy gauge metal with insulated cabinet. Motor and drive shall be vibration isolated. Complete with UL approved disconnect switch, and pre-drilled mounting holes or clips for installation.

**Duckwork –** Duckwork shall be low carbon galvanized sheet metal of lock forming quality (LFQ). Sheet metal gauge and LFQ visibly marked by manufacturer. Sizes indicated on drawings are net inside clear dimensions. For internally lined ducts maintain sizes inside.

**Low Pressure:** Static pressure in duct less than 50 mm w.g. and velocities less than 10.2 m/s.

Minimum sheet metal gauges, as follows:

SIZE OF DUCT (mm)

U.S. GAUGE GALVANIZED IRON

330 to 760	24
787 to 1372	22
1397 to 2134	20

Supports: 50 mm x 50 mm x 6.35 mm thick galvanized iron angles with baseplates, spaced to prevent sagging, bending or vibration during generator operation.

**Dampers** --Dampers shall be galvanized sheet metal with damper blades minimum 16 gauge galvanized steel with 9.5 mm minimum shaft, multi-blade type.

**Insulation** -- Insulation shall conform to the following:

Ductwork: Internal Duct Lining: Owens-Corning, Knauf, Certainteed or equal duct liner with black fire resistant coating, 50 mm thick, 24 kg/m<sup>3</sup> density.

Exhaust Pipe and MufflerComposite assembly of insulation, adhesive, sealer, vapor-barrier, coatings, and duct-lining materials shall be UL approved and meet Class 1 requirements of flame spread of 25 or less and smoke developed of 50 or less as set forth in NFPA Bulletin 90-A.

**Air Outlets** -- Furnish Titus, Krueger or equal, registers, grilles and accessories aluminum or steel construction. Provide factory baked off-white enamel finish as standard, with other materials and finishes.

Provide air outlets with qualities of those specified including noise level and adjustability. Furnish with opposed blade dampers, operable through the face.

Provide all outlets with gaskets and grounds and install so that there will be no streaking of the walls or ceilings due to leakage.

**Flexible Connections** -- Flexible connectors in ductwork shall be Mercer Rubber, Unaflex Rubber Corporation, "Ventglas" neoprene coated glass fabric or equal. Allow 25 mm minimum free space between metal collars each side of fabric. Connection shall be nominal 150 mm wide with material taunt to maintain not less than 75 mm metal to metal separation with fabric folds.

**Anti-Vibration Bases and Hangers** -- Provide bases and hangers supplied by a single manufacturer of vibration control equipment Mason, or equal. Provide types with minimum static deflection shown, with additional travel of 50% between design height and solid height, and lateral spring stiffness equal to at least 0.8 times the vertical spring stiffness. Provide neoprene coated springs for outside locations. Mason types as follows:

Type Super W: Neoprene rubber pads, nominal 50 durometer, 20 mm nominal thickness, .25 mm deflection, crossribbed or waffle design. Material to be resistant to water, chemicals and oils.

TYPE SSLFH or SLR: Individual free standing spring mounts with leveling bolts and bonded sound deadening pads. Provide with seismic housing or snubbers.

Type Z: Earthquake motion restraints assembly designed and engineered to limit movement of supported equipment during an earthquake without degrading the vibration isolation of the spring during normal equipment operating conditions. The mounts shall be engineered as a system to accept a force in any direction equal to a minimum of 1.3 times the rated load capacity of the spring isolator without yield or failure, and shall limit movement of the point of level bolt connection to supported equipment to 19 mm in any direction, relative to any fixed point on the mount assembly, while subjected to the minimum force specified. A spring isolator, drilled and tapped load plate and leveling bolt assembly shall be positioned by weld studs on the base plate, and shall carry all normal equipment operating loads.

Type 30N: Spring hanger with double deflection rubber element in metal housing bracket. Spring diameter and lower housing hole sizes shall provide for a 30° arc rod swing. Bushing in hole shall prevent metal to metal contact. Support with threaded rods.

Installation of all vibration isolator materials and supplemental equipment bases specified shall be accomplished following the manufacturer's written instructions.

**Hangers and Supports** -- Miscellaneous steel for support of all ducts shall be provided and installed in accordance with, "Provide Galvanized Reinforcing Angles, Bars, Threaded Steel Rods, Rivets, Bolts and Sheet Metal Screws", per Sheet Metal and Air-Conditioning Engineers (SMACNA) Duct Construction Standards.

Hanger rods shall be all thread with electro-galvanized finish. Size per equipment per manufacturer.

**Ductwork Specialties** -- Ductwork specialties shall conform to the following:

Flashings: Ducts through roof shall be 16-gauge, galvanized steel, flashed and counter-flashed and provided with storm collars to secure watertight construction.

Bird Screens: 14 gage, 13 mm galvanized wire mesh, set in galvanized steel frame. Provide with hinges for cleaning on fixed louvers or as indicated.

Duct Test Openings: Ventfabrics No. 699, located where measurements are required for balancing air systems. Coordinate with Air Balance Agency firm.

Joint-caulking or sealing compound: United McGill "UNI-CAST" or equal duct sealer, applied between flanges of companion angle joints, between companion angles and ducts, before riveting angles to ducts, and between all swaged and slip joints at couplings, ducts and fittings. Cover joints which fit with tolerances of 3.2 mm and over with 100 mm wide strip of canvas cemented with lagging adhesive.

**Temperature Controls** -- Temperature Controls shall be of the electric, type as manufactured by Honeywell, Barber-Colman, Johnson Service Co, or equal. Systems shall be acceptable provided that all design and control requirements specified and shown on the drawings are met.

Equipment furnished in this work that is normally wired before installation shall be furnished completely wired.

Install all temperature control and temperature control interlock as indicated on the plans. All wiring exposed in the generator, electrical rooms and wet well shall be installed in conduit.

Thermostats, timers, switches shall be mounted 1676 mm above finished floor to centerline. Provide wire guards and back plates.

### **Tunnel Ventilation Fans – Operation**

A. The Tunnel Ventilation System shall tie-into the Supervisory Control and Data Acquisition (SCADA) Programmable Logic Controller (PLC) utilizing control programming. Sequencing and scheduling shall consist of a combination of timeclock, carbon monoxide (CO) sensors and manual operation. The PLC shall allow for holiday or other times where the anticipated tunnel traffic may be different than the normal function programming.

1. During periods of off-peak operation (overnight, 11:00p.m. to 4:00a.m. Sunday through Saturday) the fans may remain OFF.
2. During times of anticipated light traffic (evenings, weekends, 4p.m. to 11p.m.) the fans may be run on LOW SPEED.
3. Each fan is linked to a CO sensor, in its vicinity, which at a pre-determined setting will start its representative fan at the LOW (less than 50ppm) setting. Upon a rise the CO levels the fan will go to maximum rated capacity (greater than 65ppm).

B. In the event of an emergency condition an override function will allow the fans to be controlled manually from the Control Room. Each fan may be run independently or simultaneously in either the "forward" or "reverse" function.

**Generator Exhaust Systems** -- Exhaust systems shall consist of a silencer, flexible exhaust fitting, exhaust piping, insulation and mounting hardware.

Provide a critical grade horizontal, end inlet, end outlet, chamber type silencer constructed of all welded carbon steel. Furnish complete with companion flanges drilled to match 56.7/68 kg ANSI specifications with gaskets, nuts and bolts. Exterior surfaces shall be prime coated. Provide saddles for mounting to overhead structure. Use resilient supports to vibration isolate silencer from mounting supports. The minimum dynamic insertion loss for the silencers as measured per laboratory standards shall be determined based on 7.6 meters sound criteria for complete package. Unit submitted must meet or exceed data shown on drawing. Silencer size shall be sufficient to ensure that measured exhaust back pressure does not exceed the maximum limitation specified by the generator set manufacturer. Provide Burgess-Manning, Universal Silencer, Nelson, Maxim silencers or equal.

Exhaust pipe shall be nominal 200 mm diameter seamless black carbon steel, Schedule 40 standard weight, ASTM A53. Pipe sizes to be determined by the generator supplier. Fittings shall be 136 kg butt weld carbon steel, ASTM A105 or ASTM A234. Flanges shall be 68 kg raised face, neck weld type carbon steel, ASTM A105, Schedule 40 standard weight bore. Support and brace securely to prevent weight on generator and isolate to prevent transmission of vibration to structure and to allow for expansion and contraction. Maintain approved clearances from combustibles.

Provide a seamless Type 316 stainless steel bellows type flexible exhaust fitting at least 450 mm long between the exhaust manifold and exhaust piping. Fitting shall be GT Exhaust Systems, or equal, furnished by muffler manufacturer supplier.

Cover the silencer and exhaust piping with exhaust insulation blankets. Do not insulate flexible connector. Install so that insulation does not interfere with the functioning of the flexible connector.

Provide minimum three (3) ply insulation blankets capable of operating in applications up to 642.4°C. Inside ply shall be knitted 304 stainless steel wire mesh. Middle ply shall be made of Type E fiberglass insulation. Outer ply shall be aluminum color silicone impregnated fiberglass fabric. Permanently mounted 304 stainless steel hooks and/or 304 stainless steel capstans shall be used as fasteners. Outside surface temperature of exhaust insulation blankets shall not exceed 92.4°C with generator operating at full load. Provide advance Thermal Products, Inc., of Santa Ana, California (1-800-826-8417) exhaust insulation blankets or equivalent.

Alternatively provide exhaust system consisting of adapters, elbows, piping, wall supports, thimble, drain tee and support assemblies. The system shall be custom fitted fabrications consisting of an air-insulated Type 316 stainless steel inner liner and outer jacket, suitable for use to 642.4°C, continuously. Exterior surface temperatures shall not exceed 92.4°C. Exhaust piping shall be removable and fastened in place by an end flange with vee-band joint design. Exhaust system shall be Selkirk Metalbestos, Metal-Fab Model PIC or equivalent.

Cover generator exhaust manifolds with an expanded metal guard for personnel protection.

## INSTALLATION

**Ventilation Fans** -- Ventilation fans shall be Installed with vibration isolators, hanger rods and sway bracing per manufacturer requirements. Secure with expansion anchors per plans.

Fans shall be checked after installation and startup. All deficiencies shall be corrected. Submit checklist and certification report.

Fans shall be controlled by a combination of timeclock, carbon monoxide (CO) monitoring system, and manual operation.

**Generator** -- Contractor shall coordinate the construction of engine-generator set foundation and air and exhaust piping systems with the generator set manufacture's written requirements. Foundation pad, anchor bolt layouts, piping and radiator ductwork sizing may be modified from those shown on the plans. Such work shall be at the Contractor's expense.

Anchor bolts for the engine-generator set bases shall be cast-in-place or embedment type.

**Piping** -- Pitch horizontal runs of exhaust pipe down away from the engine.

**Ductwork** -- Low pressure ductwork shall be constructed with gages, joints, and bracing.

Ducts 483 mm and over in greatest dimension shall be fabricated with government clip or pocket slip seams at 1525 mm centers. Diagonally crease ducts on all four sides or mechanical bead.

Longitudinal seams shall be double crimped, bent and hammered airtight.

Broken places in galvanized coating shall be completely soldered over.

Exposed ducts shall be fabricated with flat drive slip seams on 915 mm centers, reinforced with 40 mm x 450 mm flat bar wrapped around bottom and vertical sides of duct, extended from duct hanger, and secured to duct with sheet metal screws. Ducts exposed to view in occupied spaces shall be free of dents, blemishes and visual imperfections including pitting, seam marks, oil stains and discolorations including those which would impair painting.

Slope sides of transition pieces per drawings to match equipment and louver.

For lined ducts, sizes shown are clear inside insulation.

Install 50 mm x 50 mm x 6.35 mm angles on 610 mm centers maximum. Install 50 mm x 50 mm x 6.35 mm framing angles.

**Insulation** -- Ensure surface is clean and dry prior to installation. Ensure insulation is dry before and during application.

Install acoustical lining in radiator generator exhaust duct exposed in equipment room.

Cement Stick: Klips at 300 mm on center to duct with adhesive then cement lining in place with 50% covering of Fosters #81-99 safety Duct-Fas adhesive.

Install lining so that there are no raw edges of insulation exposed to air stream.

In addition, insulate any ductwork, piping, equipment, or other part of the system as necessary to provide proper system operation, avoid safety hazards, or correct excessive or unusual noise, or to avoid damage to internal spaces.

**Flexible Connectors** -- Align and space ductwork and piping accurately before installation. Do not use flexible connections to correct for misalignment.

Support ductwork and piping to prevent weight from compressing or extending flexible connection from required installed settings.

Follow manufacturer's installation instructions. Install in mid position of manufacturer's recommended range.



**Hangers** -- Support all equipment and ductwork firmly held in place , in accordance with best practice recommendations.

Do not install hanger material until approved by the Engineer.

Do not support piping by any wire, rope, wood, or other makeshift devices.

Use double nuts and lock washers on threaded rods.

Do not burn or weld any structural member unless approved by the Engineer.

Provide hanger close to point of change of direction of duct run in either horizontal or vertical plane.

Hanger Spacing Schedule: Support steel pipes at minimum 3050 mm on-center.

Insulated Piping: Install hanger around outside of insulation with Thermal Hanger Shield as minimum 20 gauge, 150 mm length.

Install generator exhaust system piping and muffler to facilitate condensate drainage.

**Supports for Ductwork** -- Miscellaneous steel for support of all ducts shall be provided and installed by the Contractor. Provide galvanized reinforcing angles, bars, threaded steel rods, rivets, bolts and sheet metal screws.

**Temperature Controls** -- Temperature controls shall be installed by trained mechanics. Installation shall include all control and control interlock wiring specified.

Prior to installation, submit diagrams, component data and description of sequence of operation for approval.

Install all control equipment and connecting piping parallel to walls, arranged to conform to building and to clear other mechanical or electrical equipment.

There shall be no power wiring in excess of 40 Vac peak voltage run in conduit with communications trunk wiring.

All tubing and conduit shall be run parallel to or at right angles to the building structure. Tubing may be run exposed in mechanical and electrical rooms or areas where other piping is exposed and run at ceiling height.

Clearly identify and label all equipment and controls, such as switches, thermostats, timers, as to function and position. Label with permanently attached bakelite plates engraved with minimum 6.35 mm high white letters on black background.

Copies of shop drawings of the entire control system shall be submitted and shall consist of a complete list of equipment and materials, including manufacturer's catalog cuts, and installation instructions. Terminal identification for all control wiring shall be shown on the shop drawings.

A complete written Sequence of Operations for temperature control function shall also be included with the submittal package.

Operating and Maintenance Data: Upon completion of the work provide a complete set of record drawings including manufacturer's descriptive literature, operating instructions, and maintenance and repair data.

Warranty: The Temperature Control contractor shall provide a one year warranty covering the complete Temperature Control System. Any manufacturing defects arising during this warranty period shall be corrected without cost to the Department.

After completion of the installation, regulate and adjust all thermostats, timers, motors and other equipment provided under this contract. Provide all programming, set all timers. A representative of the control manufacturer and Department shall be present during final acceptance, test and inspection.

Operator Instruction: During system commissioning and upon acceptable performance of the Temperature Control System, the contractor shall provide on-site "hands-on" operator instruction to the Department's and City personnel. Operator instruction during normal working hours shall be performed by a competent representative familiar with systems hardware and accessories.

**Operational Tests and Adjustments – General** -- Upon completion of the work, operate and test equipment and systems for a period of at least five (5) consecutive days to demonstrate their satisfactory overall operation. On the last day of this period, arrange for an acceptance test and final inspection. Make all necessary adjustments and corrections to systems prior to acceptance test so that systems are operating smoothly and properly and absolutely ready for check and acceptance.

Coordinate all items associated with work including all wiring in connection with mechanical equipment, and all temperature control work. Determine that these systems, equipment and apparatus are properly wired and controlled and completely ready for satisfactory operation and test.

Immediately before starting tests, check all motors and lubricate all bearings.

Operating and Safety Controls: Test at least three (3) times.

**Operational tests – Vane-Axial** -- Fans shall be tested in both forward and reverse direction. The fans shall be tested at the blade angle which shall produce the required volume of air at the required system pressure. Performance tests shall cover the range of airflow from no flow to free delivery. Test data shall be recorded on data submittal forms.

Each fan-motor unit shall be operated continuously for a total of twelve hours in the forward mode and twelve hours in the

reverse mode of rotation. During reversal, fan shall be allowed to coast to a standstill before being restarted in reverse direction.

In the event that the tests show that the fan-motor units do not comply with the requirements as to characteristics and performance, or that the brake horsepower will exceed by five percent or more than brake horsepower shown in the theoretical data submitted, the fan-motor units will be rejected unless changes are made therein and tests repeated until the specific requirements are met.

Each fan unit shall be tested to obtain sound power level data at eight-octave band center frequencies from 63 Hz to 8,000 Hz. At Contractor's option, noise testing may be carried out concurrently with Fan Performance Test specified above.

Fans shall be tested with specified nominal airflow in both forward and reverse directions. Test data shall be submitted to the Department for approval in tabular form.

Each fan unit which has satisfactorily passed all proceeding tests and inspections specified shall be subject to reversal tests. These tests shall require operation at rated operating speed for approximately 4 hours and shall require five cycles of rotation reversal. A cycle of rotation reversal is defined as reversal from one direction of motor-impeller rotation to the other direction of rotation, and then back to the first direction of rotation.

The reversal test shall begin with the fan unit operated in the forward direction of airflow for a period of 15 minutes.

At the end of the first 15-minute period of operation in the forward direction of airflow, the motor shall be electrically reversed, with a 20-second time delay imposed between the interruption of power and re-energizing of the motor for reversed rotation.

After the motor has been re-energized, the fan shall be operated in the reverse direction of airflow for a period of 20 minutes.

The test shall be continued, with alternating 20-minute periods of operation in the forward and reverse directions of airflow, until 10 rotation reversals have been performed. At the end of each 20-minute period of operation, the fan-unit motor shall be electrically reversed, with a 20-second time delay imposed between the interruption of power and re-energizing the motor for reversed location.

After five cycles of rotation reversal, i.e., ten reversals of the direction of motor and impeller rotation have been performed, the fan-motor unit shall be operated for a period of fifteen minutes.

At the end of the last fifteen minute period of operation, the fan shall be de-energized and permitted to coast to a standstill.

Resistance of the motor-winding insulation shall be measured just prior to the start of the reversal test and immediately after the end of the test. In addition, the temperature of the motor windings and of the motor frame shall be continuously recorded throughout the test. Certification of successful performance of the reversal test and certified test data shall be submitted to the Authority for approval.

After successful completion of the above tests, and air balance per the following section, the entire four fan systems shall be subject to carbon monoxide (CO) tests. Contractor shall submit a procedure of operation for review prior to conducting the tests. The procedure shall be compatible with the recommendations of the manufacturer of the CO system and the Department.

At a minimum the tests shall meet the Environmental Protection Agency (EPA) design standard of maximum exposure to carbon monoxide (CO) gases shall be not greater than 120 parts per million (PPM) for 15 minutes at peak-hour traffic.

**Air Balance** -- Provide Independent test and balance agency (Air Balance Agency) services for testing, and balancing of air distribution for heating-cooling systems, with work done under supervision of a qualified engineer, by qualified engineering technicians and trained personnel, using instruments certified accurate to limits used in standard practice for testing and balancing of air distribution for heating-cooling systems. Air Balance Agency shall be certified members of Associated Air Balance Council.

Installation Phase --

Study design specifications and drawings and prepare schedule to physically inspect mechanical equipment for air distribution systems to be tested and balanced. Provide Air Balance Agency with one (1) copy of contract plans and specifications, mechanical equipment submittals and approved change orders necessary for proper balancing of air distribution system.

Prepare tests and balancing schedule, test record forms and necessary technical information about the air distribution systems for installing heating-cooling equipment and fan systems, for complete total air balance.

Recommend adjustments and/or corrections to mechanical equipment that are necessary for proper balancing.

Each piece of equipment and the entire system shall be adjusted to ensure proper distribution of air, excessive noise, equipment vibration and proper functioning of controls. Make changes, additions and modifications to dampers, and/or drive belts and other equipment necessary for proper air balance without additional cost to Department. Allow for motor sheave changes.

Upon completion of the air handling system, the Air Balance Agency shall complete tests, analysis, and balance of air handling systems for heating-cooling-ventilating equipment. The Air Balance Agency then shall submit five (5) copies of balance report to the Engineer for review.

Air Balance Report shall at a minimum include the following data:

Title Page

- Company name/address/telephone number.
- Project name/location.
- Project architect/engineer.
- Project contractor.

Instrument List/Manufacturer/Model

Abbreviations Used

Units including generator fan, ventilation vane-axial and centrifugal exhaust fans.

Installed Equipment Data:

- Identification Number.
- Manufacture/Model Number.

Design Data:

- Air flows (CFM).
- Static Pressure.
- Fan Motor BHP.
- Fan Motor Full Load Amperage.
- Fan Motor HP.
- Fan Speed (RPM).

Balancing Test Data:

- Air Flows (CFM) exhaust.
- Static Pressures.
- Fan Speed (RPM).
- Operating Amperes.
- Fan Operating BHP.
- Air Velocity (Average).
- Electric Motors:

Manufacturer.

Type/Frame designation /Insulation Class.

Voltage/Phase/BHP/HP.

- Amperage - nameplate, no load, design conditions.
- RPM
- Service Factor.
- Starter size, rating, heater elements.

V-Belt Drive:

Identification/Location.

Required Driven RPM.

- Driven Sheave, Diameter and RPM.
- Belt, Size and Quantity.
- Motor Sheave, Diameter and RPM.
- Center to center distance, maximum, minimum and actual.

Air Balance Agency shall conduct tests listed above in the presence of the Engineer, if requested to do so.

**Sound and vibration** – Sound Field Test: With the equipment operating at design capacity, air-borne sound level observations shall be made to field verify resulting rooms and tunnel decibel levels.

Observe background noise levels with the systems off.

Observe noise levels with the system functioning under design capacity.

Field Vibration Tests:

Assure vibration isolation systems are operating properly.

Operate equipment and make audible and visual inspection to determine obvious rough operation. Contractor shall correct these conditions before proceeding further.

Upon completion of all tests and measurements, submit all reports for review including all relative information concerning test procedure, recorded levels and any unusual occurrences or general observation by the tester, including recommended corrective procedures.

In the event sound and vibration levels are in excess of allowable limits, appropriate field reduction measures shall be undertaken by the contractor at his expense to bring these affected systems to acceptable limits.

#### **10-6.04 PAYMENT**

The contract lump sum price paid for mechanical work (operations building and tunnel) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in the construction of the plumbing system, fire protection system, ventilation and exhaust system complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

### **SECTION 10-7. OPERATIONS BUILDING**

#### **GENERAL**

This work shall consist of constructing the operations building in conformance with the details shown on the plans, the provisions in Section 19, "Earthwork," and Section 51, "Concrete Structures," of the Standard Specifications, and these special provisions.

##### **Sand**

Sand for the sand fill shall conform to Section 19-3.025B, "Sand Bedding," of the Standard Specifications.

##### **Vapor Barrier**

Vapor barrier at the operations building shall conform to the following:

- A. A Certificate of Compliance for the vapor barrier material and tape shall be furnished to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.
- B. Vapor barrier shall be commercial quality polyethylene sheets not less than 0.15 mm thick. Sheets shall be as wide as practicable for application, which will result in the least number of laps as directed by the Engineer.
- C. Tape for the sealing of laps and joints shall be a pressure-sensitive adhesive tape as recommended by the manufacturer of the vapor barrier material. Tape shall be a minimum of 76 mm wide.
- D. Vapor barrier sheets shall be placed over 100 mm of free draining granular material. Sand, 75 mm thick, shall be placed over the vapor barrier. Vapor barrier shall overlap all edges a minimum of 102 mm and shall overlap all joints a minimum of 152 mm. All overlapped material shall be sealed with tape. Vapor barrier shall be carried over any pipes or conduits, which penetrate the fill. Stakes for screeding of concrete slabs shall not be placed through the vapor barrier membranes.
- E. Should the vapor barrier material be punctured or torn, the damaged section shall be replaced completely by the Contractor or patched as directed by the Engineer.

##### **Waterproofing**

Waterproofing shall conform to the provisions in Section 54, "Waterproofing," of the Standard Specifications and these special provisions.

At the option of the Contractor, a preformed membrane waterproofing system may be furnished and applied in lieu of the asphalt membrane waterproofing specified above. Preformed membrane waterproofing shall conform to these special provisions.

A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications shall be furnished for the preformed membrane sheet. The Certificate of Compliance shall include the following information: (1) type of preformed membrane sheet, and (2) the conditioner or primer application rates.

The preformed membrane waterproofing system shall consist of an adhesive, conditioner or primer applied to a prepared surface; a preformed membrane sheet of rubberized asphalt or polymer modified bitumen; mastic or tape for sealing the edges of the sheet; and a protective covering over the sheet held by an adhesive.

The preformed membrane sheet shall be either permanently applied to a polyethylene film or reinforced with a polypropylene mesh fabric, polyester/polypropylene fabric or a fiberglass mesh fabric. The membrane sheet shall conform to the following requirements:

Property	Test	Requirement	
		Polyethylene Film	Fabric Reinforced
Tensile Strength (Minimum)(1)	ASTM D 882 (2)	3.5N/mm (3)	3.5N/mm (3)
Percent Elongation at break (Minimum) (4)	ASTM D 882 (2)	150 percent (3)	25 percent (3)
Pliability	ASTM D 146 (5)	No cracks	No cracks
Thickness (Minimum) (6)	-----	1.5 mm	1.5 mm
Rubberized Asphalt Softening Point (Minimum)	AASHTO T 53	74°C	74°C
Polymer Modified Bitumen Softening Point (Minimum)	AASHTO T 53	99°C	99°C

Notes:

- (1) Breaking factor in machine direction.
- (2) Method A, average 5 samples.
- (3) At 23°C ± 2°C
- (4) Machine direction.
- (5) 180-degree bend over a 25-mm mandrel at -120°C
- (6) Total thickness of preformed membrane sheet and polyethylene film or fabric reinforcement.

Adhesives, conditioners, primers, mastics and sealing tapes shall be manufactured for use with the respective preformed membrane sheet materials and shall be applied according to the manufacturer's recommendations.

The protective covering shall be 3-mm minimum thickness hardboard or other material that furnishes equivalent protection. Backfill material and equipment shall not cut, scratch, depress or cause any other damage to the preformed membrane.

Surfaces designated to receive preformed membrane waterproofing shall be thoroughly cleaned of dirt, dust, loose or unsound concrete, and other extraneous material and shall be free from fins, sharp edges, and protrusions that would, in the opinion of the Engineer, puncture or otherwise damage the membrane. Sharp corners to be covered shall be rounded (outside) or chamfered (inside).

Surfaces shall be dry when components of the preformed membrane waterproofing system are applied.

Preformed membrane waterproofing shall not be applied to any surface until the Contractor is prepared to follow its application with the placing of the protective covering and backfill within a sufficiently short time that the membrane will not be damaged by workers or equipment, exposure to weathering, or from any other cause. Damaged membrane or protective covering shall be repaired or replaced by the Contractor at the Contractor's expense.

All projecting pipe, conduits, sleeves or other facilities passing through the preformed membrane waterproofing shall be flashed with prefabricated or field-fabricated boots, fitted coverings or other devices as necessary to provide watertight construction.

All conditioner or primers shall be thoroughly mixed and continuously agitated during application. Conditioner, primers or adhesive shall be allowed to dry to a tack free condition prior to placing membrane sheets.

The surfaces shall be recoated if membrane sheets are not placed over primer, conditioner or adhesive within the time recommended by the manufacturer.

The preformed membrane sheet shall not be applied in wet or foggy weather, nor when the ambient temperature is below 4°C.

Preformed membrane material shall be placed starting at the bottom and lapped by a minimum of 150 mm at splices and at repairs to holes or tears.

Exposed edges of membrane sheets shall have a trowelled bead of manufacturer's recommended mastic or sealing tape applied after the membrane is placed.

The surface of the preformed membrane shall be cleaned free of dirt and other deleterious material before the protective covering is placed.

The protective covering shall be placed on a coating of adhesive of a type recommended by the manufacturer. The adhesive shall be applied at a rate sufficient to hold the protective covering in position until the backfill is placed.

Preformed membrane waterproofing will be measured and paid for by the square meter as asphalt membrane waterproofing.

### **Geocomposite Drain**

Geocomposite drain at the operations building shall conform to the following:

- A. Attention is directed to "Engineering Fabrics" of these special provisions.
- B. Geocomposite drain shall consist of a manufactured core not less than 6.35 mm thick nor more than 50 mm thick with one or both sides covered with a layer of filter fabric that will provide a drainage void. The drain shall produce a flow rate, through the drainage void, of at least 25 liters per minute per meter of width at a hydraulic gradient of 1.0 and a minimum externally applied pressure of 168 kPa.
- C. A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications shall be furnished for the geocomposite drain certifying that the drain produces the required flow rate and complies with these special provisions. The Certificate of Compliance shall be accompanied by a flow capability graph for the geocomposite drain showing flow rates for externally applied pressures and hydraulic gradients. The flow capability graph shall be stamped with the verification of an independent testing laboratory.
- D. Filter fabric for the geocomposite drain shall conform to the provisions for fabric for underdrains in Section 88, "Engineering Fabrics," of the Standard Specifications.
- E. The manufactured core shall be either a preformed grid of embossed plastic, a mat of random shapes of plastic fibers, a drainage net consisting of a uniform pattern of polymeric strands forming 2 sets of continuous flow channels, or a system of plastic pillars and interconnections forming a semirigid mat.
- F. The core material and filter fabric shall be capable of maintaining the drainage void for the entire height of geocomposite drain. Filter fabric shall be integrally bonded to the side of the core material with the drainage void. Core material manufactured from impermeable plastic sheeting having nonconnecting corrugations shall be placed with the corrugations approximately perpendicular to the drainage collection system.
- G. The geocomposite drain shall be installed with the drainage void and the filter fabric facing the embankment. The fabric facing the embankment side shall overlap a minimum of 75 mm at all joints and wrap around the exterior edges a minimum of 75 mm beyond the exterior edge. If additional fabric is needed to provide overlap at joints and wrap-around at edges, the added fabric shall overlap the fabric on the geocomposite drain at least 150 mm and be attached thereto.
- H. Should the fabric on the geocomposite drain be torn or punctured, the damaged section shall be replaced completely or repaired by placing a piece of fabric that is large enough to cover the damaged area and provide a minimum 150-mm overlap.
- I. Plastic pipe shall conform to the provisions for edge drain pipe and edge drain outlets in Section 68-3, "Edge Drains," of the Standard Specifications.
- J. Treated permeable base to be placed around the slotted plastic pipe at the bottom of the geocomposite drain shall be cement treated permeable base conforming to the provisions for cement treated permeable base in Section 29, "Treated Permeable Bases," of the Standard Specifications and these special provisions.
- K. The treated permeable base shall be enclosed with a high density polyethylene sheet or PVC geomembrane, not less than 250  $\mu$ m thick, which is bonded with a suitable adhesive to the concrete and geocomposite drain. Surfaces to receive the polyethylene sheet shall be cleaned before applying the adhesive. The treated permeable base shall be compacted with a vibrating shoe type compactor.

### **Louvers**

Louvers shall be galvanized steel sheet not less than 1.63 mm thick with standard "Z" type blades and removable bronze 16 x 16 mesh bird screens mounted on the inside of the units.

Louvers shall be cleaned and painted in conformance with Section 59-1, "General," of the Standard Specifications and these special provisions.

Oils, grease, and fabrication lubricants shall be removed by solvent wash. Surfaces shall be cleaned of remaining surface treatments by hand cleaning in conformance with the requirements in Surface Preparation Specification No. 2, "Hand Tool Cleaning" of the Steel Structures Painting Council. New surfaces shall be roughened by hand cleaning or light abrasive blasting.

The coating system shall consist of the following:

- A. 1 pretreat coat (vinyl wash pretreatment)
- B. 1 prime coat (galvanized metal primer)
- C. 2 finish coats (acrylic, exterior enamel, semi-gloss)

Coatings shall be applied in conformance with the printed instructions and at the application rates recommended by the manufacturer.

Mixing and tinting shall conform to the manufacturer's printed instructions.

Coatings shall be applied only when surfaces are dry and properly prepared.

Cleaning and painting shall be scheduled so that dust and other contaminants from the cleaning process will not fall on wet, newly coated surfaces.

Each coat shall be applied to a uniform finish. Finished surfaces shall be free of surface deviations and imperfections such as skips, cloudiness, spotting, holidays, laps, brush marks, runs, sags, curtains, ropiness, improper cutting in, overspray, drips, ridges, waves, and variations in color and texture.

Each application of a multiple application finish system shall closely resemble the final color coat, except each application shall provide enough contrast in shade to distinguish the separate applications.

Each application of material shall be cured in accordance with the coating manufacturer's recommendations before applying the succeeding coating. Enamels and clear finishes shall be lightly sanded, dusted, and wiped clean between applications.

## **MEASUREMENT AND PAYMENT**

The contract lump sum price paid for operations building shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the operations building, complete in place, including structure excavation and backfill, structural concrete, bar reinforcing steel, waterproofing, geocomposite drain, sand, vapor barrier, retaining walls, concrete stoops, louvers, and miscellaneous metal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Mechanical work, electrical work, and hinged doors and hardware for the operations building will be paid for separately as provided elsewhere in these special provisions.

## **SECTION 10-8. HINGED DOORS AND HARDWARE**

### **GENERAL**

This work shall consist of furnishing and installing hinged doors, frames, and hardware items for doors as shown on the plans, in accordance with the standard specifications and these special provisions.

Manufacturer's descriptive data and a door schedule shall be submitted for approval. The door schedule shall include a description of the type, location, and size of each door and frame.

Manufacturer's technical information and catalog cuts for each item of door hardware and a door hardware schedule shall be submitted for approval prior to installation. Manufacturer's catalog drawings shall include catalog numbers, material, grade, type, size, function, design, quality, and finish of hardware. The door hardware schedule shall indicate the location and size of door opening, the door and frame material, and the size, style, finish, and quantity of the hardware components required.

Hardware shall be provided with Standard US 26D metal plated finish.

New facilities shall have a building master key system established. Locks shall have cylinders with figure eight interchangeable cores with six pin barrels. Permanent cores and keys shall be delivered to the Engineer for final installation at completion of project.

Key bows shall be stamped "State of California" and "Do Not Duplicate."

### **MATERIALS**

**Metal Door** – Metal door shall be flush, seamless steel door factory prepared and reinforced to receive hardware and having cold rolled stretcher leveled sheet steel face sheets not less than 1.22 millimeters (mm) thick (18-gage). Face sheets shall be bonded with thermosetting adhesive to rigid board honeycomb or precured foam core; or face sheets shall be welded to all parts of an assembled grid of cold-formed pressed metal stiffeners and framing members located around edges, ends, openings, and at all locations necessary to prevent buckling of face sheets. Seams shall be tack-welded, filled, and ground smooth. Bottom edge and internal stiffeners of grid type core shall have moisture vents. Welds on exposed surfaces shall be ground smooth.

Active leaf of double door shall have a full height astragal of 3.18 mm flat bar or folded sheet strip, not less than 1.52 mm thick (16-gage), welded on the outside of the active leaf.

Door shall be cleaned and treated by the bonderized process or approved phosphatizing process and then given one

factory application of metal protective rust inhibitive primer. Primer shall not contain lead type pigments.

**Pressed metal frame** – Pressed metal frame shall be not less than 1.52 mm thick (16 gage), cold-rolled, sheet steel with integral stop, mitered corners, face welded and ground smooth corners. Frames shall be reinforced in the factory for all hardware and shall be cleaned and treated by the bonderized process or an approved phosphatizing process and then given one factory application of metal protective rust inhibitive primer. Primer shall not contain lead type pigments.

**Sealants** – Sealants shall be ultraviolet and ozone resistant, gun grade polysulfide or polyurethane, multicomponent, Federal Standard (FS) TT-S-00227E, Type II, Class A (Sealing Compound, Elastomeric Type, Multicomponent, for sealing and glazing in buildings and other structures).

**Butt hinges** – Butt hinges shall be steel, 1 1/2-pair per door unless otherwise specified or shown on the plans. Non-removable pins shall be provided at outswing exterior doors. Hinge size shall be 114.3 mm X 114.3 mm unless noted otherwise.

Hinges shall be: Hager BB 1168, McKinney T4B 37869, Stanley BB 168, or equal.

**Cylindrical locksets** – Cylindrical locksets shall be steel chassis, 54 mm diameter, 69.85 mm backset. Door and frame preparation for cylindrical lockset shall conform to American National Standards Institute (ANSI) A115.1.

Lever operated lockset shall be: Best 83K6 AB 9C, Schlage D53PD RHO, Falco LY501 DG, or equal.

**Flush Bolts** – Flush bolts shall be installed at the top and bottom of the inactive leaf of pairs of doors.

Flush bolts for manual operation shall be: Builders Brass 5020, Glynn Johnson FB6, H.B. Ives 457, or equal.

**Door Closers** – Parallel arms for closers shall be installed at outswing exterior doors. Closers shall have sprayed finish to match other hardware on door.

Door closers shall be: LCN 4040, Norton 85001, Dorma 7800, or equal.

**Thresholds, Rain Drips, and Door Shoes** – Thresholds, rain drips, and door shoes shall conform to the sizes and configurations shown on plans.

Threshold, rain drip, and door shoe manufacturers shall be Pemko, Reese, Zero, or equal.

**Threshold bedding sealant** – Threshold bedding sealant shall conform to Federal Standard (FS) TT-S-001657, Type I, Sealing Compound, Silicone Rubber Base.

**Weatherstrip** – Weatherstrip shall be the frame or door manufacturer standard. Assemblies shall be provided at all exterior doors.

**Hardware** – Hardware items shall be accurately fitted, securely applied, and adjusted and lubricated in accordance with the manufacturer's instructions. Installation shall provide proper operation without bind or excessive play.

Hinges shall be installed at equal spacing with the center of the end hinges not more than 244.5 mm from the top and bottom of the door. Locksets shall be 1024 mm from the finished floor.

Thresholds shall be set in a continuous bed of sealant material.

Door controls shall be set so that the effort required to operate doors with closers shall not exceed 37.8 Newtons maximum for exterior doors and 22.2 Newtons for interior doors.

Door stops located on concrete surfaces shall be fastened rigidly and securely in place with expansion anchoring devices.

Hardware, except hinges, shall be removed from surfaces to be painted before painting.

Upon completion of installation and adjustment, the contractor shall deliver to the Engineer all dogging keys, closer valve keys, lock spanner wrenches, and other factory furnished installation aids, instructions, and maintenance guides.

**Door Hardware Groups and Schedule** – Hardware groups specified herein shall correspond to those shown on the plans:

**GROUP 1 (function: storeroom lock)**

- 3-pair butt hinges
- 1 each cylindrical lockset
- 1 each closer (active leaf)
- 1 each weatherstripping



- 2 each door shoe with drip
- 1 each threshold
- 2 each flush bolts

**GROUP 2 (function: storeroom lock)**

- 1-1/2 pair butt hinges
- 1 cylindrical lockset
- 1 closer
- 1 weatherstripping
- 1 door shoe with drip
- 1 threshold

**GROUP 3 (function: passage latch)**

- 1-1/2 pair butt hinges
- 1 latchset
- 1 closer

**INSTALLATION**

**Doors and Frames** – Doors and frames shall be installed rigidly, securely, plumb and true, and in such a manner that the doors operate freely without rubbing or binding. Clearance between frame and door shall be not more than 3.2 mm. The exterior frame shall be sealed weather-tight.

Pressed metal frames shall be secured with manufacturer's standard design clips and anchors as shown on the plans.

**Painting** – Except for the primer application specified herein, doors and frames shall be cleaned, prepared and painted as specified. Coatings shall be the best quality grade coatings of the specified types as regularly manufactured by nationally recognized paint and varnish manufacturers. Products for each coating system shall be by a single manufacturer and shall not contain lead type pigments.

Thinners, shellac, fillers, patching compounds, color tint, and other products required to achieve the specified finish shall be the manufacturer's best quality and shall be used as recommended.

**Regulatory Requirements** – Coatings and applications shall conform to the applicable laws and regulations for volatile organic compound (VOCs) emissions adopted by the air quality control district in the air basin in which the coatings are applied.

**Site Environmental Requirements** – Coatings shall not be applied when the air temperature is below 10 degrees Celsius (C), 18 degrees C (for varnishes) or when the relative humidity exceeds 75 percent.

The surface to be coated shall be maintained at a minimum temperature of 7 degrees C for a period of 24 hours prior to, and 48 hours after the application of the coating. Heating facilities shall be provided when necessary.

Continuous ventilation shall be provided during application of the coatings.

A minimum lighting level of 860.8 lumens per square meters, measured 1.22 meters from the surface to be coated, shall be provided while surfaces are being prepared for coatings and during coating applications.

**Delivery**– Coatings shall be delivered to the site in sealed, labeled containers and stored in a well ventilated area at an ambient air temperature of not less than 7 degrees C. Container labeling shall include manufacturer's name, type of coating, trade name, color designation, drying time, and instructions for tinting, mixing, and thinning.

**Maintenance Stock** – Upon completion of coating work, a full 3.785 liters container of each type and color of finish coat used shall be delivered to the location at the project site designated by the Engineer. Containers shall be tightly sealed and labeled with color, texture, and room locations where used, in addition to the manufacturer's standard product label.

**Inspection** – Surfaces to be coated at the jobsite shall be approved by the Engineer prior to the application of coatings. The Contractor shall notify the Engineer at least 3 working days prior to the application of coatings.

**Surface Preparation** – Surfaces scheduled to be coated shall be prepared in accordance with the following, except that the surfaces not specified herein shall be prepared as recommended by the coating manufacturer.

Hardware, and similar items shall be removed prior to preparing surfaces for coating. Following the application of the finish coating, the removed items shall be reinstalled in their original locations.

Dirt, oil, grease, or other surface contaminants shall be removed by scrubbing with a solution of trisodium phosphate

and warm water, and removal of all solution and residues with clean water. Mildew shall be removed by mildew wash. Chalking paint shall be removed by hand cleaning. The surfaces of existing hard or glossy coatings shall be abraded to dull the finish by hand cleaning.

Chipped, peeling, blistered, or loose coatings shall be removed by hand cleaning or water blasting. Bare areas shall be pretreated and primed as required for new work.

**Protection** – The Contractor shall provide protective devices, such as tarps screens or covers, as necessary to prevent damage to the work and to other property or persons from all cleaning and painting operations.

Paint or paint stains on surfaces not designated to be painted shall be removed by the Contractor at his expense and the original surface restored to the satisfaction of the Engineer.

**Application** -- Coatings shall be applied in accordance with the printed instructions and at the application rates recommended by the manufacturer to achieve the dry film thickness specified in these special provisions.

Mixing, thinning and tinting shall conform to the manufacturer's printed instructions. Thinning will be allowed only when recommended by manufacturer.

Coatings shall be applied only when surfaces are dry and properly prepared.

Cleaning and painting shall be scheduled so that dust and other contaminants from the cleaning process will not fall on wet, newly coated surfaces.

Materials required to be coated shall have coatings applied to all exposed surfaces, including the tops and bottoms of metal doors, and other surfaces not normally visible from eye level.

**Dry Film Thickness** – Dry film thickness shall conform to the manufacture's recommendations.

**Application Surface Finish** – Each coat shall be applied to a uniform finish. Finished surfaces shall be free of surface deviations and imperfections such as skips, cloudiness, spotting, holidays, laps, brush marks, runs, sags, curtains, ropiness, improper cutting in, overspray, drips, ridges, waves, and variations in color and texture.

Each application of a multiple application finish system shall closely resemble the final color coat, except each application shall provide enough contrast in shade to distinguish the separate applications.

**Work Required Between Applications** – Each application of material shall be cured in accordance with the coating manufacturer's recommendations before applying the succeeding coating. Enamels finishes shall be lightly sanded, dusted, and wiped clean between applications.

**Application Methods** – Coatings shall be applied by brush, roller or spray. Rollers shall be of a type which do not leave a stippled texture in the paint film. Extension handles for rollers shall not be greater than six feet in length.

If spray methods are used, surface deviations and imperfections such as, overspray, thickness deviations, lap marks, and orange peel shall be considered as evidence that the work is unsatisfactory and the Contractor shall apply the remainder of the coating by brush or roller, as approved by the Engineer.

**Cleaning** – Upon completion of all operations, the coated surfaces shall be thoroughly cleaned of dust, dirt, grease, or other unsightly materials or substances.

Surfaces marred or damaged as a result of the Contractor's operations shall be repaired, at his expense, to match the condition of the surfaces prior to the beginning of the Contractor's operations.

#### **PAYMENT -**

The contract lump sum price paid for hinged doors and hardware shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in furnishing, installing, and painting hinge doors and hardware in the operations building, complete, in place, as shown on the plans, and as specified in these special provisions, and as directed by the Engineer.

#### **SECTION 11. (BLANK)**

#### **SECTION 12. (BLANK)**

#### **SECTION 13. (BLANK)**

## SECTION 14 FEDERAL REQUIREMENTS FOR FEDERAL-AID CONSTRUCTION PROJECTS

**GENERAL.**—The work herein proposed will be financed in whole or in part with Federal funds, and therefore all of the statutes, rules and regulations promulgated by the Federal Government and applicable to work financed in whole or in part with Federal funds will apply to such work. The "Required Contract Provisions, Federal-Aid Construction Contracts, Form FHWA 1273, are included in this Section 14. Whenever in said required contract provisions references are made to "SHA contracting officer", "SHA resident engineer", or "authorized representative of the SHA", such references shall be construed to mean "Engineer" as defined in Section 1-1.18 of the Standard Specifications.

**PERFORMANCE OF PREVIOUS CONTRACT.**—In addition to the provisions in Section II, "Nondiscrimination," and Section VII, "Subletting or Assigning the Contract," of the required contract provisions, the Contractor shall comply with the following:

The bidder shall execute the CERTIFICATION WITH REGARD TO THE PERFORMANCE OF PREVIOUS CONTRACTS OR SUBCONTRACTS SUBJECT TO THE EQUAL OPPORTUNITY CLAUSE AND THE FILING OF REQUIRED REPORTS located in the proposal. No request for subletting or assigning any portion of the contract in excess of \$10,000 will be considered under the provisions of Section VII of the required contract provisions unless such request is accompanied by the CERTIFICATION referred to above, executed by the proposed subcontractor.

**NON-COLLUSION PROVISION.**—The provisions in this section are applicable to all contracts except contracts for Federal Aid Secondary projects.

Title 23, United States Code, Section 112, requires as a condition precedent to approval by the Federal Highway Administrator of the contract for this work that each bidder file a sworn statement executed by, or on behalf of, the person, firm, association, or corporation to whom such contract is to be awarded, certifying that such person, firm, association, or corporation has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with the submitted bid. A form to make the non-collusion affidavit statement required by Section 112 as a certification under penalty of perjury rather than as a sworn statement as permitted by 28, USC, Sec. 1746, is included in the proposal.

**PARTICIPATION BY MINORITY BUSINESS ENTERPRISES IN SUBCONTRACTING.**—Part 23, Title 49, Code of Federal Regulations applies to this Federal-aid project. Pertinent sections of said Code are incorporated in part or in its entirety within other sections of these special provisions.

### Schedule B—Information for Determining Joint Venture Eligibility

(This form need not be filled in if all joint venture firms are minority owned.)

1. Name of joint venture \_\_\_\_\_
2. Address of joint venture \_\_\_\_\_
3. Phone number of joint venture \_\_\_\_\_
4. Identify the firms which comprise the joint venture. (The MBE partner must complete Schedule A.) \_\_\_\_\_  
\_\_\_\_\_  
  - a. Describe the role of the MBE firm in the joint venture. \_\_\_\_\_
  - b. Describe very briefly the experience and business qualifications of each non-MBE joint venturer: \_\_\_\_\_  
\_\_\_\_\_
5. Nature of the joint venture's business \_\_\_\_\_
6. Provide a copy of the joint venture agreement. \_\_\_\_\_
7. What is the claimed percentage of MBE ownership? \_\_\_\_\_
8. Ownership of joint venture: (This need not be filled in if described in the joint venture agreement, provided by question 6.).
  - a. Profit and loss sharing.
  - b. Capital contributions, including equipment.

- c. Other applicable ownership interests.
9. Control of and participation in this contract. Identify by name, race, sex, and "firm" those individuals (and their titles) who are responsible for day-to-day management and policy decision making, including, but not limited to, those with prime responsibility for:
- a. Financial decisions \_\_\_\_\_
- b. Management decisions, such as:
- (1) Estimating \_\_\_\_\_
- (2). Marketing and sales \_\_\_\_\_
- (3). Hiring and firing of management personnel \_\_\_\_\_
- (4) Purchasing of major items or supplies \_\_\_\_\_
- c. Supervision of field operations \_\_\_\_\_

Note.—If, after filing this Schedule B and before the completion of the joint venture's work on the contract covered by this regulation, there is any significant change in the information submitted, the joint venture must inform the grantee, either directly or through the prime contractor if the joint venture is a subcontractor.

#### Affidavit

"The undersigned swear that the foregoing statements are correct and include all material information necessary to identify and explain the terms and operation of our joint venture and the intended participation by each joint venturer in the undertaking. Further, the undersigned covenant and agree to provide to grantee current, complete and accurate information regarding actual joint venture work and the payment therefor and any proposed changes in any of the joint venture arrangements and to permit the audit and examination of the books, records and files of the joint venture, or those of each joint venturer relevant to the joint venture, by authorized representatives of the grantee or the Federal funding agency. Any material misrepresentation will be grounds for terminating any contract which may be awarded and for initiating action under Federal or State laws concerning false statements."

Name of Firm	Name of Firm
Signature	Signature
Name	Name
Title	Title
Date	Date

Date \_\_\_\_\_

State of \_\_\_\_\_

County of \_\_\_\_\_

On this \_\_\_\_ day of \_\_\_\_\_, 19 \_\_, before me appeared (Name) \_\_\_\_\_, to me personally known, who, being duly sworn, did execute the foregoing affidavit, and did state that he or she was properly authorized by (Name of firm) \_\_\_\_\_ to execute the affidavit and did so as his or her free act and deed.

Notary Public \_\_\_\_\_

Commission expires \_\_\_\_\_

[Seal]

Date \_\_\_\_\_

State of \_\_\_\_\_

County of \_\_\_\_\_

On this \_\_\_\_ day of \_\_\_\_\_, 19 \_\_, before me appeared (Name) \_\_\_\_\_ to me personally known, who, being duly sworn, did execute the foregoing affidavit, and did state that he or she was properly authorized by (Name of firm) \_\_\_\_\_ to execute the affidavit and did so as his or her free act and deed.

Notary Public \_\_\_\_\_

Commission expires \_\_\_\_\_

[Seal]

**REQUIRED CONTRACT PROVISIONS  
FEDERAL-AID CONSTRUCTION CONTRACTS**

**I. GENERAL**

1. These contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.
2. Except as otherwise provided for in each section, the contractor shall insert in each subcontract all of the stipulations contained in these Required Contract Provisions, and further require their inclusion in any lower tier subcontract or purchase order that may in turn be made. The Required Contract Provisions shall not be incorporated by reference in any case. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with these Required Contract Provisions.
3. A breach of any of the stipulations contained in these Required Contract Provisions shall be sufficient grounds for termination of the contract.
4. A breach of the following clauses of the Required Contract Provisions may also be grounds for debarment as provided in 29 CFR 5.12:

Section I, paragraph 2;  
Section IV, paragraphs 1, 2, 3, 4, and 7;  
Section V, paragraphs 1 and 2a through 2g.

5. Disputes arising out of the labor standards provisions of Section IV (except paragraph 5) and Section V of these Required Contract Provisions shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the U.S. Department of Labor (DOL) as set forth in 29 CFR 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the DOL, or the contractor's employees or their representatives.
6. **Selection of Labor:** During the performance of this contract, the contractor shall not:
  - a. discriminate against labor from any other State, possession, or territory of the United States (except for employment preference for Appalachian contracts, when applicable, as specified in Attachment A), or
  - b. employ convict labor for any purpose within the limits of the project unless it is labor performed by convicts who are on parole, supervised release, or probation.

**II. NONDISCRIMINATION**

(Applicable to all Federal-aid construction contracts and to all related subcontracts of \$10,000 or more.)

1. **Equal Employment Opportunity:** Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, and 41 CFR 60) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The Equal Opportunity Construction Contract Specifications set forth under 41 CFR 60-4.3 and the provisions of the American Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:
  - a. The contractor will work with the State highway agency (SHA) and the Federal Government in carrying out EEO obligations and in their review of his/her activities under the contract.
  - b. The contractor will accept as his operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, preapprenticeship, and/or on-the-job training."

2. **EEO Officer:** The contractor will designate and make known to the SHA contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active contractor program of EEO and who must be assigned adequate authority and responsibility to do so.
3. **Dissemination of Policy:** All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:
  - a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.
  - b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.
  - c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minority group employees.
  - d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.
  - e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.
4. **Recruitment:** When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minority groups in the area from which the project work force would normally be derived.
  - a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minority group applicants. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority group applicants may be referred to the contractor for employment consideration.
  - b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, he is expected to observe the provisions of that agreement to the extent that the system permits the contractor's compliance with EEO contract provisions. (The DOL has held that where implementation of such agreements have the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Executive Order 11246, as amended.)
  - c. The contractor will encourage his present employees to refer minority group applicants for employment. Information and procedures with regard to referring minority group applicants will be discussed with employees.
5. **Personnel Actions:** Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:

- a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.
  - b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.
  - c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.
  - d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with his obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of his avenues of appeal.
6. Training and Promotion:
- a. The contractor will assist in locating, qualifying, and increasing the skills of minority group and women employees, and applicants for employment.
  - b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision.
  - c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.
  - d. The contractor will periodically review the training and promotion potential of minority group and women employees and will encourage eligible employees to apply for such training and promotion.
7. **Unions:** If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use his/her best efforts to obtain the cooperation of such unions to increase opportunities for minority groups and women within the unions, and to effect referrals by such unions of minority and female employees. Actions by the contractor either directly or through a contractor's association acting as agent will include the procedures set forth below:
- a. The contractor will use best efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minority group members and women for membership in the unions and increasing the skills of minority group employees and women so that they may qualify for higher paying employment.
  - b. The contractor will use best efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.
  - c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the SHA and shall set forth what efforts have been made to obtain such information.
  - d. In the event the union is unable to provide the contractor with a reasonable flow of minority and women referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through



independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minority group persons and women. (The DOL has held that it shall be no excuse that the union with which the contractor has a collective bargaining agreement providing for exclusive referral failed to refer minority employees.) In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the SHA.

8. **Selection of Subcontractors, Procurement of Materials and Leasing of Equipment:** The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment.
  - a. The contractor shall notify all potential subcontractors and suppliers of his/her EEO obligations under this contract.
  - b. Disadvantaged business enterprises (DBE), as defined in 49 CFR 23, shall have equal opportunity to compete for and perform subcontracts which the contractor enters into pursuant to this contract. The contractor will use his best efforts to solicit bids from and to utilize DBE subcontractors or subcontractors with meaningful minority group and female representation among their employees. Contractors shall obtain lists of DBE construction firms from SHA personnel.
  - c. The contractor will use his best efforts to ensure subcontractor compliance with their EEO obligations.
9. **Records and Reports:** The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following completion of the contract work and shall be available at reasonable times and places for inspection by authorized representatives of the SHA and the FHWA.
  - a. The records kept by the contractor shall document the following:
    - (1) The number of minority and non-minority group members and women employed in each work classification on the project;
    - (2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women;
    - (3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minority and female employees; and
    - (4) The progress and efforts being made in securing the services of DBE subcontractors or subcontractors with meaningful minority and female representation among their employees.
  - b. The contractors will submit an annual report to the SHA each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data.

### III. NONSEGREGATED FACILITIES

(Applicable to all Federal-aid construction contracts and to all related subcontracts of \$10,000 or more.)

- a. By submission of this bid, the execution of this contract or subcontract, or the consummation of this material supply agreement or purchase order, as appropriate, the bidder, Federal-aid construction contractor, subcontractor, material supplier, or vendor, as appropriate, certifies that the firm does not maintain or provide for its employees any segregated facilities at any of its establishments, and that the firm does not permit its employees to perform their services at any location, under its control, where segregated facilities are maintained. The firm agrees that a breach of this certification is a violation of the EEO provisions of this contract. The firm further certifies that no employee will be denied access to adequate facilities on the basis of sex or disability.

- b. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, time clocks, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive, or are, in fact, segregated on the basis of race, color, religion, national origin, age or disability, because of habit, local custom, or otherwise. The only exception will be for the disabled when the demands for accessibility override (e.g. disabled parking).
- c. The contractor agrees that it has obtained or will obtain identical certification from proposed subcontractors or material suppliers prior to award of subcontracts or consummation of material supply agreements of \$10,000 or more and that it will retain such certifications in its files.

#### **IV. PAYMENT OF PREDETERMINED MINIMUM WAGE**

(Applicable to all Federal-aid construction contracts exceeding \$2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural minor collectors, which are exempt.)

##### **1. General:**

- a. All mechanics and laborers employed or working upon the site of the work will be paid unconditionally and not less often than once a week and without subsequent deduction or rebate on any account [except such payroll deductions as are permitted by regulations (29 CFR 3)] issued by the Secretary of Labor under the Copeland Act (40 U.S.C. 276c) the full amounts of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment. The payment shall be computed at wage rates not less than those contained in the wage determination of the Secretary of Labor (hereinafter "the wage determination") which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor or its subcontractors and such laborers and mechanics. The wage determination (including any additional classifications and wage rates conformed under paragraph 2 of this Section IV and the DOL poster (WH-1321) or Form FHWA-1495) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers. For the purpose of this Section, contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act (40 U.S.C. 276a) on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of Section IV, paragraph 3b, hereof. Also, for the purpose of this Section, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in paragraphs 4 and 5 of this Section IV.
- b. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein, provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed.
- c. All rulings and interpretations of the Davis-Bacon Act and related acts contained in 29 CFR 1, 3, and 5 are herein incorporated by reference in this contract.

##### **2. Classification:**

- a. The SHA contracting officer shall require that any class of laborers or mechanics employed under the contract, which is not listed in the wage determination, shall be classified in conformance with the wage determination.
- b. The contracting officer shall approve an additional classification, wage rate and fringe benefits only when the following criteria have been met:
  - (1) the work to be performed by the additional classification requested is not performed by a classification in the wage determination;
  - (2) the additional classification is utilized in the area by the construction industry;
  - (3) the proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination; and

(4) with respect to helpers, when such a classification prevails in the area in which the work is performed.

- c. If the contractor or subcontractors, as appropriate, the laborers and mechanics (if known) to be employed in the additional classification or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the DOL, Administrator of the Wage and Hour Division, Employment Standards Administration, Washington, D.C. 20210. The Wage and Hour Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.
- d. In the event the contractor or subcontractors, as appropriate, the laborers or mechanics to be employed in the additional classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. Said Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.
- e. The wage rate (including fringe benefits where appropriate) determined pursuant to paragraph 2c or 2d of this Section IV shall be paid to all workers performing work in the additional classification from the first day on which work is performed in the classification.

**3. Payment of Fringe Benefits:**

- a. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor or subcontractors, as appropriate, shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly case equivalent thereof.
- b. If the contractor or subcontractor, as appropriate, does not make payments to a trustee or other third person, he/she may consider as a part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

**4. Apprentices and Trainees (Programs of the U.S. DOL) and Helpers:**

a. Apprentices:

(1) Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the DOL, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau, or if a person is employed in his/her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State apprenticeship agency (where appropriate) to be eligible for probationary employment as an apprentice.

(2) The allowable ratio of apprentices to journeyman-level employees on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any employee listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate listed in the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a

contractor or subcontractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman-level hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

- (3) Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator for the Wage and Hour Division determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.
- (4) In the event the Bureau of Apprenticeship and Training, or a State apprenticeship agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor or subcontractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the comparable work performed by regular employees until an acceptable program is approved.

b. Trainees:

- (1) Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the DOL, Employment and Training Administration.
- (2) The ratio of trainees to journeyman-level employees on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.
- (3) Every trainee must be paid at not less than the rate specified in the approved program for his/her level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman-level wage rate on the wage determination which provides for less than full fringe benefits for apprentices, in which case such trainees shall receive the same fringe benefits as apprentices.
- (4) In the event the Employment and Training Administration withdraws approval of a training program, the contractor or subcontractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Helpers:

Helpers will be permitted to work on a project if the helper classification is specified and defined on the applicable wage determination or is approved pursuant to the conformance procedure set forth in Section IV.2. Any worker listed on a payroll at a helper wage rate, who is not a helper under an approved definition, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed.

**5. Apprentices and Trainees (Programs of the U.S. DOT):**

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are

not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

**6. Withholding:**

The SHA shall upon its own action or upon written request of an authorized representative of the DOL withhold, or cause to be withheld, from the contractor or subcontractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements which is held by the same prime contractor, as much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the SHA contracting officer may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

**7. Overtime Requirements:**

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers, mechanics, watchmen, or guards (including apprentices, trainees, and helpers described in paragraphs 4 and 5 above) shall require or permit any laborer, mechanic, watchman, or guard in any workweek in which he/she is employed on such work, to work in excess of 40 hours in such workweek unless such laborer, mechanic, watchman, or guard receives compensation at a rate not less than one-and-one-half times his/her basic rate of pay for all hours worked in excess of 40 hours in such workweek.

**8. Violation:**

Liability for Unpaid Wages; Liquidated Damages: In the event of any violation of the clause set forth in paragraph 7 above, the contractor and any subcontractor responsible thereof shall be liable to the affected employee for his/her unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory) for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer, mechanic, watchman, or guard employed in violation of the clause set forth in paragraph 7, in the sum of \$10 for each calendar day on which such employee was required or permitted to work in excess of the standard work week of 40 hours without payment of the overtime wages required by the clause set forth in paragraph 7.

**9. Withholding for Unpaid Wages and Liquidated Damages:**

The SHA shall upon its own action or upon written request of any authorized representative of the DOL withhold, or cause to be withheld, from any monies payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph 8 above.

## **V. STATEMENTS AND PAYROLLS**

(Applicable to all Federal-aid construction contracts exceeding \$2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural collectors, which are exempt.)

**1. Compliance with Copeland Regulations (29 CFR 3):**

The contractor shall comply with the Copeland Regulations of the Secretary of Labor which are herein incorporated by reference.

**2. Payrolls and Payroll Records:**

- a. Payrolls and basic records relating thereto shall be maintained by the contractor and each subcontractor during the course of the work and preserved for a period of 3 years from the date of completion of the contract for all laborers, mechanics, apprentices, trainees, watchmen, helpers, and guards working at the site of the work.

- b. The payroll records shall contain the name, social security number, and address of each such employee; his or her correct classification; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalent thereof the types described in Section 1(b)(2)(B) of the Davis Bacon Act); daily and weekly number of hours worked; deductions made; and actual wages paid. In addition, for Appalachian contracts, the payroll records shall contain a notation indicating whether the employee does, or does not, normally reside in the labor area as defined in Attachment A, paragraph 1. Whenever the Secretary of Labor, pursuant to Section IV, paragraph 3b, has found that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1(b)(2)(B) of the Davis Bacon Act, the contractor and each subcontractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, that the plan or program has been communicated in writing to the laborers or mechanics affected, and show the cost anticipated or the actual cost incurred in providing benefits. Contractors or subcontractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprentices and trainees, and ratios and wage rates prescribed in the applicable programs.
- c. Each contractor and subcontractor shall furnish, each week in which any contract work is performed, to the SHA resident engineer a payroll of wages paid each of its employees (including apprentices, trainees, and helpers, described in Section IV, paragraphs 4 and 5, and watchmen and guards engaged on work during the preceding weekly payroll period). The payroll submitted shall set out accurately and completely all of the information required to be maintained under paragraph 2b of this Section V. This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal stock number 029-005-0014-1), U.S. Government Printing Office, Washington, D.C. 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors.
- d. Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his/her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:
  - (1) that the payroll for the payroll period contains the information required to be maintained under paragraph 2b of this Section V and that such information is correct and complete;
  - (2) that such laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in the Regulations, 29 CFR 3;
  - (3) that each laborer or mechanic has been paid not less than the applicable wage rate and fringe benefits or cash equivalent for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.
- e. The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 2d of this Section V.
- f. The falsification of any of the above certifications may subject the contractor to civil or criminal prosecution under 18 U.S.C. 1001 and 31 U.S.C. 231.
- g. The contractor or subcontractor shall make the records required under paragraph 2b of this Section V available for inspection, copying, or transcription by authorized representatives of the SHA, the FHWA, or the DOL, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the SHA, the FHWA, the DOL, or all may, after written notice to the contractor, sponsor, applicant, or owner, take such actions as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

## **VI. RECORD OF MATERIALS, SUPPLIES, AND LABOR**

1. On all Federal-aid contracts on the National Highway System, except those which provide solely for the installation of protective devices at railroad grade crossings, those which are constructed on a force account or direct labor basis, highway beautification contracts, and contracts for which the total final construction cost for roadway and bridge is less than \$1,000,000 (23 CFR 635) the contractor shall:
  - a. Become familiar with the list of specific materials and supplies contained in Form FHWA-47, "Statement of Materials and Labor Used by Contractor of Highway Construction Involving Federal Funds," prior to the commencement of work under this contract.
  - b. Maintain a record of the total cost of all materials and supplies purchased for and incorporated in the work, and also of the quantities of those specific materials and supplies listed on Form FHWA-47, and in the units shown on Form FHWA-47.
  - c. Furnish, upon the completion of the contract, to the SHA resident engineer on Form FHWA-47 together with the data required in paragraph 1b relative to materials and supplies, a final labor summary of all contract work indicating the total hours worked and the total amount earned.
2. At the prime contractor's option, either a single report covering all contract work or separate reports for the contractor and for each subcontract shall be submitted.

## **VII. SUBLETTING OR ASSIGNING THE CONTRACT**

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the State. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635).
  - a. "Its own organization" shall be construed to include only workers employed and paid directly by the prime contractor and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor, assignee, or agent of the prime contractor.
  - b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid on the contract as a whole and in general are to be limited to minor components of the overall contract.
2. The contract amount upon which the requirements set forth in paragraph 1 of Section VII is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.
3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the SHA contracting officer determines is necessary to assure the performance of the contract.
4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the SHA contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the SHA has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

## **VIII. SAFETY: ACCIDENT PREVENTION**

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the SHA contracting officer may

determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).
3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).

#### **IX. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS**

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, the following notice shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

#### **Notice To All Personnel Engaged On Federal-Aid Highway Projects**

18 U.S.C. 1020 READS AS FOLLOWS:

"Whoever being an officer, agent, or employee of the United States, or any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined not more than \$10,000 or imprisoned not more than 5 years or both."

#### **X. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT**

(Applicable to all Federal-aid construction contracts and to all related subcontracts of \$100,000 or more.)

By submission of this bid or the execution of this contract, or subcontract, as appropriate, the bidder, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any facility that is or will be utilized in the performance of this contract, unless such contract is exempt under the Clean Air Act, as amended (42 U.S.C. 1857 et seq., as amended by Pub.L. 91-604), and under the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq., as amended by Pub.L. 92-500), Executive Order 11738, and regulations in implementation thereof (40 CFR 15) is not listed, on the date of contract award, on the U.S. Environmental Protection Agency (EPA) List of Violating Facilities pursuant to 40 CFR 15.20.



2. That the firm agrees to comply and remain in compliance with all the requirements of Section 114 of the Clean Air Act and Section 308 of the Federal Water Pollution Control Act and all regulations and guidelines listed thereunder.
3. That the firm shall promptly notify the SHA of the receipt of any communication from the Director, Office of Federal Activities, EPA, indicating that a facility that is or will be utilized for the contract is under consideration to be listed on the EPA List of Violating Facilities.
4. That the firm agrees to include or cause to be included the requirements of paragraph 1 through 4 of this Section X in every nonexempt subcontract, and further agrees to take such action as the government may direct as a means of enforcing such requirements.

## **XI. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION**

### **1. Instructions for Certification - Primary Covered Transactions:**

(Applicable to all Federal-aid contracts - 49 CFR 29)

- a. By signing and submitting this proposal, the prospective primary participant is providing the certification set out below.
- b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.
- c. The certification in this clause is a material representation of fact upon which reliance was placed when the department or agency determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause of default.
- d. The prospective primary participant shall provide immediate written notice to the department or agency to whom this proposal is submitted if any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
- e. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the department or agency to which this proposal is submitted for assistance in obtaining a copy of those regulations.
- f. The prospective primary participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.
- g. The prospective primary participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
- h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to,

check the nonprocurement portion of the "Lists of Parties Excluded From Federal Procurement or Nonprocurement Programs" (Nonprocurement List) which is compiled by the General Services Administration.

- i. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
- j. Except for transactions authorized under paragraph f of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

**Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion — Primary Covered Transactions**

1. The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:
  - a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
  - b. Have not within a 3-year period preceding this proposal been convicted of or had a civil judgement rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
  - c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph 1b of this certification; and
  - d. Have not within a 3-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.
2. Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

**2. Instructions for Certification - Lower Tier Covered Transactions:**

(Applicable to all subcontracts, purchase orders and other lower tier transactions of \$25,000 or more - 49 CFR 29)

- a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.
- b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.
- c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.
- d. The terms "covered transaction," "debarred," "suspended," "ineligible," "primary covered transaction," "participant," "person," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.

- e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
- f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
- g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.
- h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
- i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

#### **Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion — Lower Tier Covered Transactions**

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.
2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

#### **XII. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING**

(Applicable to all Federal-aid construction contracts and to all related subcontracts which exceed \$100,000 - 49 CFR 20)

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:
  - a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
  - b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.
3. The prospective participant also agrees by submitting his or her bid or proposal that he or she shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such recipients shall certify and disclose accordingly.

## FEDERAL-AID FEMALE AND MINORITY GOALS

In accordance with Section II, "Nondiscrimination," of "Required Contract Provisions Federal-aid Construction Contracts" the following are the goals for female utilization:

Goal for Women (applies nationwide).....(percent)	6.9
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The following are goals for minority utilization:

### CALIFORNIA ECONOMIC AREA

	<b>Goal (Percent)</b>
<b>174 Redding, CA:</b>	
Non-SMSA Counties	6.8
CA Lassen; CA Modoc; CA Plumas; CA Shasta; CA Siskiyou; CA Tehama.	
<b>175 Eureka, CA</b>	
Non-SMSA Counties	6.6
CA Del Norte; CA Humboldt; CA Trinity.	
<b>176 San Francisco-Oakland-San Jose, CA:</b>	
SMSA Counties:	
7120 Salinas-Seaside-Monterey, CA	28.9
CA Monterey.	
7360 San Francisco-Oakland	25.6
CA Alameda; CA Contra Costa; CA Marin; CA San Francisco; CA San Mateo.	
7400 San Jose, CA	19.6
CA Santa Clara.	
7485 Santa Cruz, CA.	14.9
CA Santa Cruz.	
7500 Santa Rosa, CA	9.1
CA Sonoma.	
8720 Vallejo-Fairfield- Napa, CA	17.1
CA Napa; CA Solano	
Non-SMSA Counties	23.2
CA Lake; CA Mendocino; CA San Benito	
<b>177 Sacramento, CA:</b>	
SMSA Counties:	
6920 Sacramento, CA	16.1
CA Placer; CA Sacramento; CA Yolo.	
Non-SMSA Counties	14.3
CA Butte; CA Colusa; CA El Dorado; CA Glenn; CA Nevada; CA Sierra; CA Sutter; CA Yuba.	
<b>178 Stockton-Modesto, CA:</b>	
SMSA Counties:	
5170 Modesto, CA	12.3
CA Stanislaus.	
8120 Stockton, CA	24.3
CA San Joaquin.	
Non-SMSA Counties	19.8
CA Alpine; CA Amador; CA Calaveras; CA Mariposa; CA Merced; CA Tuolumne.	

		<b>Goal (Percent)</b>
<b>179</b>	<b>Fresno-Bakersfield, CA</b>	
	SMSA Counties:	
	0680 Bakersfield, CA CA Kern.	19.1
	2840 Fresno, CA CA Fresno.	26.1
	Non-SMSA Counties CA Kings; CA Madera; CA Tulare.	23.6
<b>180</b>	<b>Los Angeles, CA:</b>	
	SMSA Counties:	
	0360 Anaheim-Santa Ana-Garden Grove, CA CA Orange.	11.9
	4480 Los Angeles-Long Beach, CA CA Los Angeles.	28.3
	6000 Oxnard-Simi Valley-Ventura, CA CA Ventura.	21.5
	6780 Riverside-San Bernardino-Ontario, CA. CA Riverside; CA San Bernardino.	19.0
	7480 Santa Barbara-Santa Maria-Lompoc, CA CA Santa Barbara.	19.7
	Non-SMSA Counties CA Inyo; CA Mono; CA San Luis Obispo.	24.6
<b>181</b>	<b>San Diego, CA:</b>	
	SMSA Counties	
	7320 San Diego, CA. CA San Diego.	16.9
	Non-SMSA Counties CA Imperial.	18.2

In addition to the reporting requirements set forth elsewhere in this contract the Contractor and subcontractors holding subcontracts, not including material suppliers, of \$10,000 or more, shall submit for every month of July during which work is performed, employment data as contained under Form FHWA PR-1391 (Appendix C to 23 CFR, Part 230), and in accordance with the instructions included thereon.

## **FEDERAL REQUIREMENT TRAINING SPECIAL PROVISIONS**

As part of the Contractor's equal employment opportunity affirmative action program, training shall be provided as follows:

The Contractor shall provide on-the-job training to develop full journeymen in the types of trades or job classification involved.

The goal for the number of trainees or apprentices to be trained under the requirements of this special provision will be 12.

In the event the Contractor subcontracts a portion of the contract work, he shall determine how many, if any, of the trainees or apprentices are to be trained by the subcontractor, provided however, that the Contractor shall retain the primary responsibility for meeting the training requirements imposed by this special provision. The Contractor shall also insure that this Training Special Provision is made applicable to such subcontract. Where feasible, 25 percent of trainees or apprentices in each occupation shall be in their first year of apprenticeship or training.

The number of trainees or apprentices shall be distributed among the work classifications on the basis of the Contractor's needs and the availability of journeymen in the various classifications within a reasonable area of recruitment. Prior to commencing work, the Contractor shall submit to the Department for approval the number of trainees or apprentices to be trained in each selected classification and training program to be used. Furthermore, the Contractor shall specify the starting time for training in each of the classifications. The Contractor will be credited for each trainee or apprentice employed by him on the contract work who is currently enrolled or becomes enrolled in an approved program and will be reimbursed for such trainees or apprentices as provided hereinafter.

Training and upgrading of minorities and women toward journeymen status is a primary objective of this Training Special Provision. Accordingly, the Contractor shall make every effort to enroll minority and women trainees or apprentices (e.g., by conducting systematic and direct recruitment through public and private sources likely to yield minority and women trainees or apprentices) to the extent such persons are available within a reasonable area of recruitment. The Contractor will be responsible for demonstrating the steps that he has taken in pursuance thereof, prior to a determination as to whether the Contractor is in compliance with this Training Special Provision. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training, whether a member of a minority group or not.

No employee shall be employed as a trainee or apprentice in any classification in which he has successfully completed a training course leading to journeyman status or in which he has been employed as a journeyman. The Contractor should satisfy this requirement by including appropriate questions in the employee application or by other suitable means. Regardless of the method used the Contractor's records should document the findings in each case.

The minimum length and type of training for each classification will be as established in the training program selected by the Contractor and approved by both the Department and the Federal Highway Administration. The Department and the Federal Highway Administration will approve a program if it is reasonably calculated to meet the equal employment opportunity obligations of the Contractor and to qualify the average trainee or apprentice for journeyman status in the classification concerned by the end of the training period. Furthermore, apprenticeship programs registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training, or with the State of California, Department of Industrial Relations, Division of Apprenticeship Standards recognized by the Bureau and training programs approved but not necessarily sponsored by the U.S. Department of Labor, Manpower Administration, Bureau of Apprenticeship and Training shall also be considered acceptable provided it is being administered in a manner consistent with the equal employment obligations of Federal-aid highway construction contracts. Approval or acceptance of a training program shall be obtained from the State prior to commencing work on the classification covered by the program. It is the intention of these provisions that training is to be provided in the construction crafts rather than clerk-typists or secretarial-type positions. Training is permissible in lower level management positions such as office engineers, estimators, timekeepers, etc., where the training is oriented toward construction applications. Training in the laborer classification may be permitted provided that significant and meaningful training is provided and approved by the division office. Some offsite training is permissible as long as the training is an integral part of an approved training program and does not comprise a significant part of the overall training.

Except as otherwise noted below, the Contractor will be reimbursed 80 cents per hour of training given an employee on this contract in accordance with an approved training program. As approved by the Engineer, reimbursement will be made for training of persons in excess of the number specified herein. This reimbursement will be made even though the Contractor receives additional training program funds from other sources, provided such other source does not specifically prohibit the Contractor from receiving other reimbursement. Reimbursement for offsite training indicated above may only be made to the Contractor where he does one or more of the following and the trainees or apprentices are concurrently employed on a Federal-aid project; contributes to the cost of the training, provides the instruction to the trainee or apprentice or pays the trainee's or apprentice's wages during the offsite training period.

No payment shall be made to the Contractor if either the failure to provide the required training, or the failure to hire the trainee or apprentice as a journeyman, is caused by the Contractor and evidences a lack of good faith on the part of the Contractor in meeting the requirements of this Training Special Provision. It is normally expected that a trainee or apprentice will begin his training on the project as soon as feasible after start of work utilizing the skill involved and remain on the project as long as training opportunities exist in his work classification or until he has completed his training program. It is not required that all trainees or apprentices be on board for the entire length of the contract. A Contractor will have fulfilled his responsibilities under this Training Special Provision if he has provided acceptable training to the number of trainees or apprentices specified. The number trained shall be determined on the basis of the total number enrolled on the contract for a significant period.

Only trainees or apprentices registered in a program approved by the State of California's State Administrator of Apprenticeship may be employed on the project and said trainees or apprentices shall be paid the standard wage specified under the regulations of the craft or trade at which they are employed.

The Contractor shall furnish the trainee or apprentice a copy of the program he will follow in providing the training. The Contractor shall provide each trainee or apprentice with a certification showing the type and length of training satisfactorily completed.

The Contractor will provide for the maintenance of records and furnish periodic reports documenting his performance under this Training Special Provision.